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DRINKING WATER SURVEILLANCE PROGRAM

LINDSAY WATER TREATMENT PLANT

ANNUAL REPORT 1990

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LINDSAY
WATER TREATMENT PLANT

DRINKING WATER SURVEILLANCE PROGRAM

ANNUAL REPORT 1990

SEPTEMBER 1992



HAZARDOUS CONTAMINANTS
COORDINATING COMMITTEE
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TORONTO, ONTARIO M4V 1P5

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EXECUTIVE SUMMARY

DRINKING WATER SURVEILLANCE PROGRAM

LINDSAY WATER TREATMENT PLANT 1990 ANNUAL REPORT

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. In 1990, 76 systems were being monitored.

The Lindsay water treatment plant is a conventional treatment plant which treats water from the Scugog River. The process consists of coagulation, flocculation, clarification (upflow clarifier), filtration, and disinfection. This plant has a design capacity of $22.7 \times 1000 \text{ m}^3/\text{day}$. The Lindsay water treatment plant serves a population of approximately 15,000.

Water at the plant and at two locations in the distribution system was sampled for the presence of approximately 180 parameters. Parameters were divided into the following groups: bacteriological, inorganic and physical (laboratory chemistry, field chemistry and metals), and organic (chloroaromatics, chlorophenols, pesticides and PCB, phenolics, polyaromatic hydrocarbons, specific pesticides and volatiles). Samples were analyzed for specific pesticides and chlorophenols twice a year in the spring and fall.

Table A is a summary of all results by group.

No known health related guidelines were exceeded.

The Lindsay water treatment plant, for the sample year 1990, produced good quality water and this was maintained in the distribution system.

Positive volatile organics were found in 1990 and were also reported in the previous annual report. An external source in the plant is suspected. Municipal and Ministry of the Environment personnel are attempting to locate this source.

TABLE A
DRINKING WATER SURVEILLANCE PROGRAM LINDSAY WTP

SUMMARY TABLE BY SCAN

A POSITIVE VALUE DENOTES THAT THE RESULT IS GREATER THAN THE STATISTICAL LIMIT OF DETECTION AND IS QUANTIFIABLE
A '.' INDICATES THAT NO SAMPLE WAS TAKEN

SCAN	SITE 1			SITE 2			SITE 3			SITE 4		
	TESTS	POSITIVE	%POSITIVE	TESTS	POSITIVE	%POSITIVE	TESTS	POSITIVE	%POSITIVE	TESTS	POSITIVE	%POSITIVE
BACTERIOLOGICAL	27	20	74	9	2	22	8	3	37	8	5	62
CHEMISTRY (FLD)	33	33	100	65	64	98	120	113	94	108	98	90
CHEMISTRY (LAB)	242	216	89	239	183	76	353	314	88	335	301	89
METALS	264	106	40	264	81	30	460	193	41	414	203	49
CHLOROAROMATICS	140	0	0	140	0	0	98	0	0	126	0	0
CHLOROPHENOLS	6	0	0	12	0	0	.	.	.	.	.	.
PAH	169	0	0	169	0	0	17	0	0	17	0	0
PESTICIDES & PCB	342	0	0	355	1	0	149	1	0	192	1	0
PHENOLICS	11	4	36	11	4	36	.	.	.	.	.	.
SPECIFIC PESTICIDES	56	0	0	62	0	0	7	0	0	9	0	0
VOLATILES	261	0	0	319	37	11	290	33	11	261	29	11
TOTAL	1551	379		1645	372		1502	657		1470	637	

DRINKING WATER SURVEILLANCE PROGRAM

LINDSAY WATER TREATMENT PLANT 1990 ANNUAL REPORT

INTRODUCTION

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. In 1990, 76 systems were being monitored.

Appendix A has a full description of the DWSP.

The DWSP was initiated for the Lindsay water treatment plant in the summer of 1989. A previous annual report was published for 1989.

PLANT DESCRIPTION

The Lindsay water treatment plant is a conventional treatment plant which treats water from the Scugog River. The process consists of coagulation, flocculation, clarification (upflow clarifier), filtration, and disinfection. This plant has a design capacity of $22.7 \times 1000 \text{ m}^3/\text{day}$. The Lindsay water treatment plant serves a population of approximately 15,000.

The sample day flows ranged from $7.0 \times 1000 \text{ m}^3/\text{day}$ to $13.0 \times 1000 \text{ m}^3/\text{day}$.

General plant information is presented in Table 1 and a schematic of plant processes, chemical addition points and sampling locations in Figure 1.

SAMPLING AND ANALYSES

Sample lines in the plant were flushed prior to sampling to ensure that the water obtained was indicative of its origin and not residual water standing in the sample line.

At all distribution system locations two types of samples were obtained, a standing and a free flow. The standing sample consisted of water that had been in the household plumbing and service connection for a minimum of six hours. These samples were used to make an assessment of the change in the levels of inorganic compounds and metals, due to leaching from, or deposition on, the plumbing system. The only analyses carried out on the standing samples therefore, were General Chemistry and Metals. The free flow

sample represented fresh water from the distribution main, since the sample tap was flushed for five minutes prior to sampling.

Attempts were made to capture the same block of water at each sampling point by taking the retention time into consideration. Retention time was calculated by dividing the volume of water between two sampling points by sample day flow. For example, if it was determined that retention time within the plant was five hours, then there would be a five hour interval between the raw and treated sampling. Similarly, if it was estimated that it took approximately one day for the water to travel from the plant to the distribution system site, this site would be sampled one day after the treated water from the plant.

Stringent DWSP sampling protocols were followed to ensure that all samples were taken in a uniform manner (see Appendix B).

Plant operating personnel routinely analyze parameters for process control (Table 2).

Water at the plant and at two locations in the distribution system was sampled for the presence of approximately 180 parameters. Parameters were divided into the following groups: bacteriological, inorganic and physical (laboratory chemistry, field chemistry and metals), and organic (chloroaromatics, chlorophenols, pesticides and PCB, phenolics, polyaromatic hydrocarbons, specific pesticides and volatiles). Samples were analyzed for specific pesticides and chlorophenols twice a year in the spring and fall. Laboratory analyses were conducted at the Ministry of the Environment facilities in Rexdale, Ontario.

RESULTS

Field measurements were recorded on the day of sampling and were entered onto the DWSP database as submitted by plant personnel.

Table 3 contains information on delay time between raw and treated water sampling, flow rate, and treatment chemical dosages.

Table 4 is a summary break-down of the number of water samples analyzed by parameter and by water type. The number of times that a positive or trace result was detected is also reported.

Positive denotes that the result is greater than the statistical limit of detection established by the Ministry of the Environment laboratory staff and is quantifiable. Trace (<T) denotes that the level measured is greater than the lowest value detectable by the method but lies so close to the detection limit that it cannot be confidently quantified.

Table 5 presents the results for parameters detected on at least one occasion.

Table 6 lists all parameters analyzed in the DWSP.

Associated guidelines and detection limits are also supplied on Tables 5 and 6. Parameters are listed alphabetically within each scan.

DISCUSSION

GENERAL

Water quality was judged by comparison with the Ontario Drinking Water Objectives publication (ODWOs). When an Ontario Drinking Water Objective (ODWO) was not available, guidelines/limits from other agencies were used. These guidelines were obtained from the Parameter Listing System database.

IN THIS REPORT, DISCUSSION IS LIMITED TO:

- **THE TREATED AND DISTRIBUTED WATER;**
- **ONLY THOSE PARAMETERS WITH CONCENTRATIONS ABOVE GUIDELINE VALUES; AND**
- **POSITIVE ORGANIC PARAMETERS DETECTED.**

BACTERIOLOGICAL

Guidelines for bacteriological sampling and testing of a supply are developed to maintain a proper supervision of its bacteriological quality. Routine monitoring programs usually require that multiple samples be collected in a given system. Full interpretation of bacteriological quality cannot be made on the basis of single samples.

Standard plate count is a test used to supplement routine analysis for coliform bacteria. The limit for standard plate count (at 35°C after 48 hours) in the ODWOs is 500 counts/mL (based on a geometric mean of 5 or more samples). DWSP bacteriological analysis of treated and distributed water was limited to standard plate count, which may indicate some deterioration in water quality if the guideline of 500 counts/mL is exceeded.

Standard plate count (membrane filtration) exceeded the ODWO Maximum Desirable Concentration of 500 counts/mL in 2 of 8 distribution water samples with a maximum reported value of 510.0 counts/mL.

INORGANIC & PHYSICAL

CHEMISTRY (FIELD)

It is desirable that the temperature of drinking water be less than 15°C. The palatability of water is enhanced by its coolness. A temperature below 15°C will tend to reduce the growth of nuisance organisms and hence minimize associated taste, colour, odour and corrosion problems. The temperature of the delivered water may increase in the distribution system due to the warming effect of the soil in late summer and fall and/or as a result of higher temperatures in the source water.

Field temperature exceeded the ODWO Maximum Desirable Concentration of 15°C in 10 of 30 treated and distributed water samples with a maximum reported value of 26.0°C.

CHEMISTRY (LAB)

Colour in drinking water may be due to the presence of natural or synthetic substances as well as certain metallic ions.

Colour exceeded the ODWO Maximum Desirable Concentration of 5 HZU in 12 of 29 treated and distributed water samples with a maximum reported value of 17.0 HZU.

Dissolved organic carbon exceeded the ODWO Maximum Desirable Concentration of 5.0 mg/L in 15 of 29 treated and distributed water samples with a maximum reported value of 7.6 mg/L.

The ODWOs indicate that a hardness level of between 80 and 100 mg/L as calcium carbonate for domestic waters provides an acceptable balance between corrosion and encrustation. Water supplies with a hardness greater than 200 mg/L are considered poor and would possess a tendency to form scale deposits and result in excessive soap consumption.

Hardness exceeded the ODWO Aesthetic or Recommended Operational Guideline of 80-100 mg/L in 29 of 29 treated and distributed water samples with a maximum reported value of 254.4 mg/L.

Elevated conductivity is often associated with high hardness levels.

Conductivity exceeded the European Economic Community (EEC) Aesthetic Guideline Level of 400 umho/cm in 15 of 29 treated and distributed water samples with a maximum reported value of 516.0 umho/cm.

Total ammonium exceeded the EEC Aesthetic Guideline Level of 0.05 mg/L in 1 distribution water samples with a maximum reported value of 0.06 mg/L.

Turbidity in water is caused by the presence of suspended matter such as clay, silt, colloidal particles, plankton and other microscopic organisms. The most important potential health effect of turbidity is its interference with disinfection in the treatment plant and the maintenance of a chlorine residual. The ODWO Maximum Acceptable Concentration for turbidity is 1.0 Formazin Turbidity Units (FTU).

Although the laboratory turbidity exceeded the Maximum Acceptable Concentration in 2 of 11 treated water samples with values of 1.1 and 1.2 FTU, the corresponding field turbidity values were 0.8 and 0.3 FTU. The field turbidity concentrations were considered more reliable.

METALS

At present, there is no evidence that aluminum is physiologically harmful and no health limit for drinking water has been specified. The measure of aluminum in treated water is important to indicate the efficiency of the treatment process. The ODWOs indicate that a useful guideline is to maintain a residual below 100 ug/L as aluminum in the water leaving the plant, to avoid problems in the distribution system.

Aluminum exceeded the ODWO Aesthetic or Recommended Operational Guideline of 100 ug/L in 23 of 30 treated and distributed water samples with a maximum reported value of 430.0 ug/L.

Iron exceeded the ODWO Maximum Desirable Concentration of 300 ug/L in 1 distribution water sample with a maximum reported value of 310.0 ug/L.

ORGANIC

CHLOROAROMATICS

Hexachlorocyclopentadiene was reported at positive levels in 3 of 8 treated and distributed water samples with a maximum reported value of 170.0 ng/L. The United States Environmental Protection Agency has an Ambient Water Quality Criteria of 206,000 ng/L for hexachlorocyclopentadiene.

The results of the other parameters in the chloroaromatic scan showed that none were detected above trace levels.

CHLOROPHENOLS

The results of the chlorophenol scan showed that none were detected.

POLYAROMATIC HYDROCARBONS (PAH)

The results of the PAH scan showed that none were detected.

PESTICIDES & PCB

The results of the PCB scan showed that none were detected.

The results of the regular pesticide scan showed that none were detected above trace levels.

PHENOLICS

Phenolic compounds are present in the aquatic environment as a result of natural and/or industrial processes. The ODWOs recommend, as an operational guideline, that phenolic substances in drinking water not exceed 2.0 ug/L. This limit has been set primarily to prevent undesirable taste and odours, particularly in chlorinated water.

Phenolics exceeded the ODWO Aesthetic or Recommended Operational Guideline of 2.0 ug/L in 1 of 11 treated water samples with a maximum reported value of 2.8 ug/L.

SPECIFIC PESTICIDES

The results of the specific pesticides scan showed that none were detected.

VOLATILES

Benzene was found at positive levels in 4 of the 30 treated and distributed water samples with a maximum reported value of 2.2 ug/L. This was below the ODWO Maximum Acceptable Concentration of 5.0 ug/L.

Toluene was found at positive levels in 3 of the 30 treated and distributed water samples with a maximum reported value of 2.4 ug/L. This was below the ODWO Aesthetic Objective of 24.0 ug/L.

O-xylene was found at positive levels in 2 of the 30 treated and distributed water samples with a maximum reported value of 1.3 ug/L. This was below the ODWO Aesthetic Objective of 300.0 ug/L.

The above volatile organics (benzene, toluene and xylene) were detected at positive and trace levels in the treated and distributed water only. Trace levels of other volatiles were also only detected in the finished water. This appears to indicate a source of contamination within the treatment plant. Levels found were not consistent and when an intensive survey at the plant was conducted, results failed to determine the source. Municipal and Ministry personnel are still investigating.

Trihalomethanes (THMs) are produced during the water treatment process and will always occur in chlorinated waters. THMs are comprised of chloroform, chlorodibromomethane and dichlorobromomethane; bromoform occurs occasionally. Results are reported for the individual compounds as well as for total THMs. Only total THMs results are discussed.

Total THMs were found at positive levels in the 30 treated and distributed water samples analyzed with a maximum level of 141.2 ug/L. This was below the ODWO Maximum Acceptable Concentration of 350 ug/L.

CONCLUSIONS

Positive volatile organics were found in 1990 and were also reported in the previous annual report. A source in the plant is suspected. Municipal and Ministry of the Environment personnel are attempting to locate this source.

The Lindsay water treatment plant, for the sample year 1990, produced good quality water and this was maintained in the distribution system.

No known health related guidelines were exceeded.

FIGURE 1

LINDSAY WTP

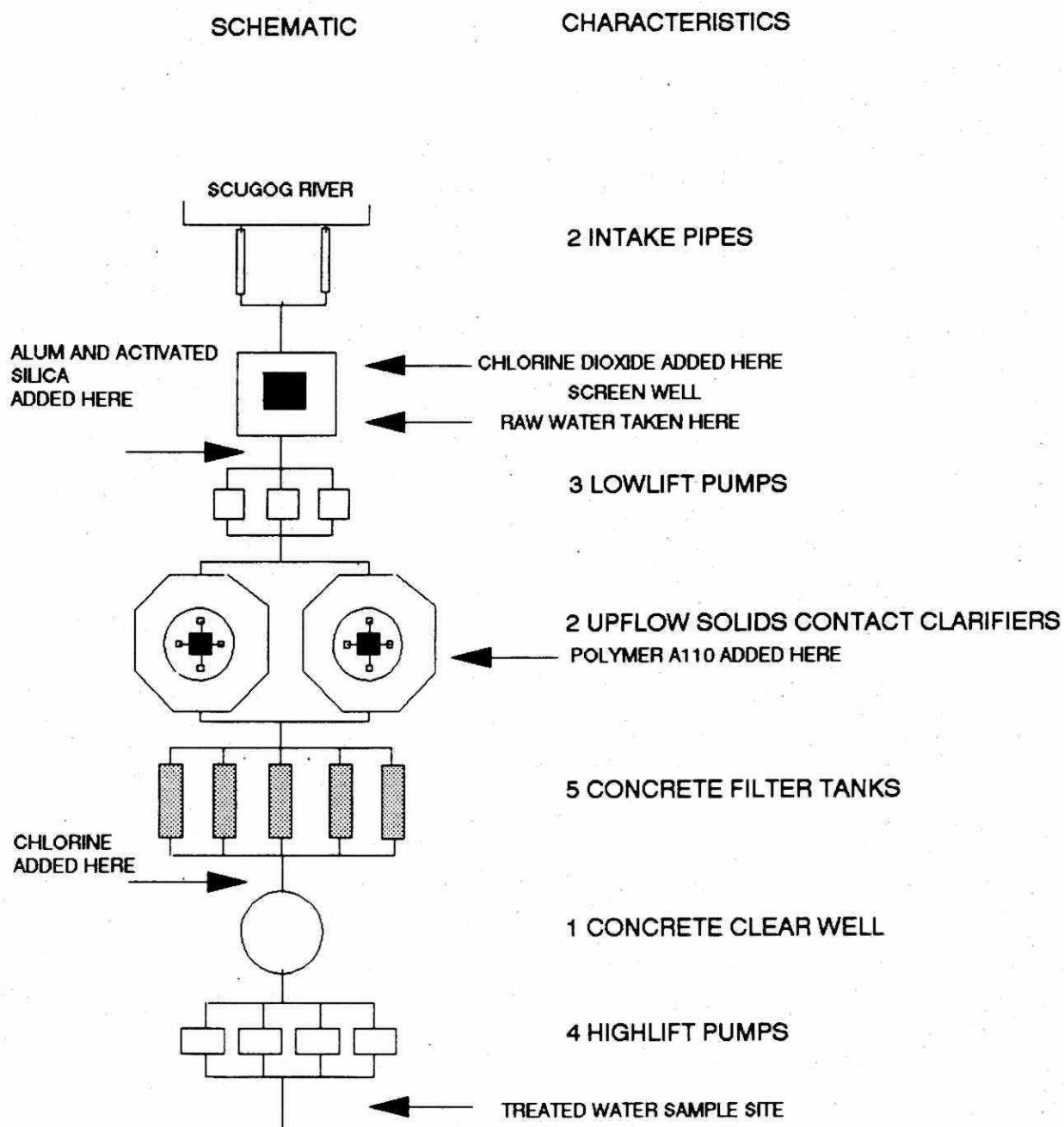


TABLE 1
DRINKING WATER SURVEILLANCE PROGRAM
PLANT GENERAL REPORT

WORKS #: 220000175
PLANT NAME: LINDSAY WATER TREATMENT PLANT

DISTRICT: PETERBOROUGH
REGION: CENTRAL
DISTRICT OFFICER: MR. J. BOURQUE

UTM #: 176811604912760

PLANT SUPERINTENDENT: MR. D. HARTWELL

ADDRESS: 50 WOLFE STREET
P.O. BOX 180
LINDSAY, ONTARIO
K9B 4S1

(Telephone) (705 878-5411)

MUNICIPALITY: LINDSAY
AUTHORITY: MUNICIPAL

PLANT INFORMATION:

PLANT VOLUME:	-	(x 1000 m3)
DESIGN CAPACITY :	22.73	(x 1000 m3/day)
RATED CAPACITY:	-	(x 1000 m3/day)

<u>MUNICIPALITY:</u>	<u>POPULATION:</u>
LINDSAY	15,000

TABLE 2
DRINKING WATER SURVEILLANCE PROGRAM
IN-PLANT MONITORING

PARAMETER -----	LOCATION -----	FREQUENCY -----
FREE CHLORINE RESIDUAL	TREATED WATER	HOURLY
TOTAL CHLORINE RESIDUAL	TREATED WATER	CONTINUOUS
PH	RAW WATER TREATED WATER	DAILY DAILY
TEMPERATURE	RAW WATER	CONTINUOUS
TURBIDITY	RAW WATER TREATED WATER	DAILY CONTINUOUS

TABLE 3
DRINKING WATER SURVEILLANCE PROGRAM LINDSAY WTP SAMPLE DAY CONDITIONS FOR 1990

			<u>TREATMENT CHEMICAL DOSAGE (MG/L)</u>					
			COAGULATION	COAGULATION AID	ACTIVATED SILICA	POST CHLORINATION	ACTIVATION	
			ALUM LIQUID	POLYELECTROLYTE	SODIUM SILICATE	CHLORINE	CHLORINE	
DATE	DELAY *	FLOW						
	TIME(HRS)	(1000M3)						
FEB 27	3.00	13.000	100.00	.40	10.00	2.10	3.90	
MAR 27	6.00	7.000	100.00	.80		1.20		
APR 24	4.00	13.000	100.00	.80	5.00	.90	2.00	
MAY 29	3.50	.000	100.00	.80	14.60	1.20	2.00	
JUN 26	3.50	13.000	100.00	.40	8.00	3.10	3.10	
JUL 31	3.00	13.000	100.00	.40	8.00	.92	3.10	
AUG 29	3.00	13.000	100.00	.40	8.00	1.40	3.10	
SEP 25	3.00	13.000	100.00	.40		3.50		
OCT 23	3.50	13.000	100.00	.40	8.00	2.40	3.10	
NOV 27	3.00	13.000	100.00	.40	8.00	2.50	3.10	
DEC 19	3.00	13.000	100.00	.80	4.00	5.40	1.80	

* THE DELAY TIME BETWEEN THE RAW AND TREATED WATER SAMPLING, SHOULD ESTIMATE THE RETENTION TIME.

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM LINDSAY WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 3			SITE 2		
	TOTAL POSITIVE TRACE			TOTAL POSITIVE TRACE			TOTAL POSITIVE TRACE			TOTAL POSITIVE TRACE		
BACTERIOLOGICAL												
FECAL COLIFORM MF	9	7	0	.	.	.	.	.	.	.	.	.
STANDRD PLATE CNT MF	.	.	.	9	2	0	8	3	0	8	5	0
TOTAL COLIFORM MF	9	4	0	.	.	.	.	.	.	.	.	.
T COLIFORM BCKGRD MF	9	9	0	.	.	.	.	.	.	.	.	.
*TOTAL GROUP BACTERIOLOGICAL	27	20	0	9	2	0	8	3	0	8	5	0
CHEMISTRY (FLD)												
FLD CHLORINE (COMB)	.	.	.	11	10	0	20	20	0	18	18	0
FLD CHLORINE FREE	.	.	.	11	11	0	20	13	0	18	8	0
FLD CHLORINE (TOTAL)	.	.	.	11	11	0	20	20	0	18	18	0
FLD PH	11	11	0	11	11	0	20	20	0	18	18	0
FLD TEMPERATURE	11	11	0	11	11	0	20	20	0	18	18	0
FLD TURBIDITY	11	11	0	10	10	0	20	20	0	18	18	0
*TOTAL SCAN CHEMISTRY (FLD)	33	33	0	65	64	0	120	113	0	108	98	0
CHEMISTRY (LAB)												
ALKALINITY	11	11	0	11	11	0	19	19	0	18	18	0
CALCIUM	11	11	0	11	11	0	19	19	0	18	18	0
CYANIDE	11	0	0	11	0	1	.	.	.	.	.	.
CHLORIDE	11	11	0	11	11	0	19	19	0	18	18	0
COLOUR	11	11	0	11	9	2	19	19	0	18	18	0
CONDUCTIVITY	11	11	0	11	11	0	19	19	0	18	18	0
DISS ORG CARBON	11	11	0	11	11	0	19	19	0	18	18	0
FLUORIDE	11	10	1	11	5	5	19	5	14	18	3	15
HARDNESS	11	11	0	11	11	0	19	19	0	18	18	0
IONCAL	11	11	0	11	11	0	20	19	0	18	18	0
LANGELIERS INDEX	11	11	0	8	8	0	10	10	0	11	11	0
MAGNESIUM	11	11	0	11	11	0	19	19	0	18	18	0
SODIUM	11	11	0	11	11	0	19	19	0	18	18	0
AMMONIUM TOTAL	11	11	0	11	4	5	19	14	3	18	15	0
NITRITE	11	7	4	11	3	5	19	5	13	18	5	13
TOTAL NITRATES	11	9	2	11	8	2	19	14	3	18	15	3
NITROGEN TOT KJELD	11	11	0	11	11	0	19	19	0	18	18	0
PH	11	11	0	11	11	0	19	19	0	18	18	0
PHOSPHORUS FIL REACT	11	4	6	11	0	5	.	.	.	.	.	.
PHOSPHORUS TOTAL	11	10	1	11	3	8	.	.	.	.	.	.
SULPHATE	11	11	0	11	11	0	19	19	0	18	18	0
TURBIDITY	11	11	0	11	11	0	19	19	0	18	18	0
*TOTAL SCAN CHEMISTRY (LAB)	242	216	14	239	183	33	353	314	33	335	301	31

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM LINDSAY WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 3			SITE 2		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
METALS												
SILVER	11	0	0	11	0	0	20	0	1	18	0	0
ALUMINUM	11	11	0	11	11	0	20	20	0	18	18	0
ARSENIC	11	0	11	11	0	9	20	0	15	18	0	15
BARIUM	11	11	0	11	11	0	20	20	0	18	18	0
BORON	11	7	4	11	7	4	20	13	7	18	10	8
BERYLLIUM	11	0	1	11	0	1	20	0	1	18	0	4
CADMIUM	11	0	0	11	0	0	20	0	3	18	0	0
COBALT	11	0	11	11	0	8	20	0	12	18	0	11
CHROMIUM	11	1	9	11	0	11	20	2	17	18	3	15
COPPER	11	0	11	11	0	11	20	20	0	18	18	0
IRON	11	9	2	11	0	5	20	0	20	18	14	4
MERCURY	11	0	1	11	1	2	.	.	.	.	.	.
MANGANESE	11	11	0	11	11	0	20	20	0	18	18	0
MOLYBDENUM	11	0	11	11	0	11	20	1	19	18	0	18
NICKEL	11	0	2	11	0	1	20	0	6	18	8	2
LEAD	11	8	3	11	0	11	20	12	8	18	18	0
ANTIMONY	11	1	10	11	1	10	20	11	9	18	5	13
SELENIUM	11	0	0	11	0	0	20	0	0	18	0	5
STRONTIUM	11	11	0	11	11	0	20	20	0	18	18	0
TITANIUM	11	11	0	11	7	4	20	14	6	18	17	1
THALLIUM	11	0	0	11	0	0	20	0	0	18	0	0
URANIUM	11	4	7	11	0	6	20	0	14	18	2	11
VANADIUM	11	10	1	11	11	0	20	20	0	18	18	0
ZINC	11	11	0	11	10	1	20	20	0	18	18	0
*TOTAL SCAN METALS	264	106	84	264	81	95	460	193	138	414	203	107
*TOTAL GROUP INORGANIC & PHYSICAL	539	355	98	568	328	128	933	620	171	857	602	138

CHLOROAROMATICS

HEXACHLOROBUTADIENE	10	0	0	10	0	0	7	0	0	9	0	0
123 TRICHLOROBENZENE	10	0	0	10	0	0	7	0	0	9	0	0
1234 T-CHLOROBENZENE	10	0	0	10	0	0	7	0	0	9	0	0
1235 T-CHLOROBENZENE	10	0	0	10	0	0	7	0	0	9	0	0
124 TRICHLOROBENZENE	10	0	0	10	0	0	7	0	0	9	0	0
1245 T-CHLOROBENZENE	10	0	0	10	0	0	7	0	0	9	0	0
135 TRICHLOROBENZENE	10	0	0	10	0	0	7	0	0	9	0	0
HCB	10	0	0	10	0	0	7	0	0	9	0	0
HEXACHLOROETHANE	10	0	0	10	0	1	7	0	0	9	0	0
OCTACHLOROSTYRENE	10	0	0	10	0	0	7	0	0	9	0	0
PENTACHLOROBENZENE	10	0	0	10	0	0	7	0	0	9	0	0
236 TRICHLOROTOLUENE	10	0	0	10	0	0	7	0	0	9	0	0
245 TRICHLOROTOLUENE	10	0	0	10	0	0	7	0	0	9	0	0
26A TRICHLOROTOLUENE	10	0	0	10	0	0	7	0	0	9	0	0
*TOTAL SCAN CHLOROAROMATICS	140	0	0	140	0	1	98	0	0	126	0	0

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM LINDSAY WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 3			SITE 2		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
CHLOROPHENOLS												
234 TRICHLOROPHENOL	1	0	0	2	0	0	.	.	.	.	.	.
2345 T-CHLOROPHENOL	1	0	0	2	0	0	.	.	.	.	.	.
2356 T-CHLOROPHENOL	1	0	0	2	0	0	.	.	.	.	.	.
245-TRICHLOROPHENOL	1	0	0	2	0	0	.	.	.	.	.	.
246-TRICHLOROPHENOL	1	0	0	2	0	0	.	.	.	.	.	.
PENTACHLOROPHENOL	1	0	0	2	0	0	.	.	.	.	.	.
*TOTAL SCAN CHLOROPHENOLS	6	0	0	12	0	0	0	0	0	0	0	0
PAH												
PHENANTHRENE	10	0	0	10	0	0	1	0	0	1	0	0
ANTHRACENE	9	0	0	9	0	0	1	0	0	1	0	0
FLUORANTHENE	10	0	0	10	0	0	1	0	0	1	0	0
PYRENE	10	0	0	10	0	0	1	0	0	1	0	0
BENZO(A)ANTHRACENE	10	0	0	10	0	0	1	0	0	1	0	0
CHRYSENE	10	0	0	10	0	0	1	0	0	1	0	0
DIMETH. BENZ(A)ANTHR	10	0	0	10	0	0	1	0	0	1	0	0
BENZO(E) PYRENE	10	0	0	10	0	0	1	0	0	1	0	0
BENZO(B) FLUORANTHEN	10	0	0	10	0	0	1	0	0	1	0	0
PERYLENE	10	0	0	10	0	0	1	0	0	1	0	0
BENZO(K) FLUORANTHEN	10	0	0	10	0	0	1	0	0	1	0	0
BENZO(A) PYRENE	10	0	0	10	0	0	1	0	0	1	0	0
BENZO(G,H,I) PERYLEN	10	0	0	10	0	0	1	0	0	1	0	0
DIBENZO(A,H) ANTHRAC	10	0	0	10	0	0	1	0	0	1	0	0
INDENO(1,2,3-C,D) PY	10	0	0	10	0	0	1	0	0	1	0	0
BENZO(B) CHRYSENE	10	0	0	10	0	0	1	0	0	1	0	0
CORONENE	10	0	0	10	0	0	1	0	0	1	0	0
*TOTAL SCAN PAH	169	0	0	169	0	0	17	0	0	17	0	0
PESTICIDES & PCB												
ALDRIN	10	0	0	10	0	0	7	0	0	9	0	0
ALPHA BHC	10	0	2	10	0	5	7	0	3	9	0	5
BETA BHC	10	0	0	10	0	0	7	0	0	9	0	0
LINDANE	10	0	0	10	0	0	7	0	0	9	0	0
ALPHA CHLORDANE	10	0	0	10	0	0	7	0	0	9	0	0
GAMMA CHLORDANE	10	0	0	10	0	0	7	0	0	9	0	0
DIELDRIN	10	0	0	10	0	0	7	0	0	9	0	0
METHOXYCHLOR	10	0	0	10	0	0	7	0	0	9	0	0
ENDOSULFAN I	10	0	0	10	0	0	7	0	0	9	0	0
ENDOSULFAN II	10	0	0	10	0	0	7	0	0	9	0	0
ENDRIN	10	0	0	10	0	0	7	0	0	9	0	0
ENDOSULFAN SULPHATE	10	0	0	10	0	0	7	0	0	9	0	0
HEPTACHLOR EPOXIDE	10	0	0	10	0	0	7	0	0	9	0	0
HEPTACHLOR	10	0	0	10	0	0	7	0	0	9	0	0
MIREX	10	0	0	10	0	0	7	0	0	9	0	0
OXYCHLORDANE	10	0	0	10	0	0	7	0	0	9	0	0
OPDDT	10	0	0	10	0	0	7	0	0	9	0	0
PCB	10	0	0	10	0	0	7	0	0	9	0	0
DDD	10	0	0	10	0	0	7	0	0	9	0	0
PPDDE	10	0	0	10	0	0	7	0	0	9	0	0

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM LINDSAY WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 3			SITE 2		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
PPDDT	10	0	0	10	0	0	7	0	0	9	0	0
AMETRINE	10	0	0	11	0	0	.	.	.	.	.	.
ATRAZINE	10	0	3	11	0	2	.	.	.	.	.	.
ATRATONE	10	0	0	11	0	0	.	.	.	.	.	.
CYANAZINE (BLADEx)	10	0	0	11	0	0	.	.	.	.	.	.
DESETHYLATRAZINE	10	0	0	11	0	0	.	.	.	.	.	.
D-ETHYL SIMAZINE	10	0	0	11	0	0	.	.	.	.	.	.
PROMETONE	10	0	0	11	0	0	.	.	.	.	.	.
PROPAZINE	10	0	0	11	0	0	.	.	.	.	.	.
PROMETRYNE	10	0	0	11	0	0	.	.	.	.	.	.
METRIBUZIN (SENCOR)	9	0	0	10	0	0	.	.	.	.	.	.
SIMAZINE	10	0	0	11	0	0	.	.	.	.	.	.
ALACHLOR (LASSO)	10	0	0	11	0	0	.	.	.	.	.	.
METOLACHLOR	10	0	0	11	0	0	.	.	.	.	.	.
HEXACLCYCLOPENTADIEN	3	0	0	3	1	0	2	1	0	3	1	0
*TOTAL SCAN PESTICIDES & PCB	342	0	5	355	1	7	149	1	3	192	1	5

PHENOLICS												
PHENOLICS	11	4	3	11	4	5	.	.	.	.	.	.
*TOTAL SCAN PHENOLICS	11	4	3	11	4	5	0	0	0	0	0	0

SPECIFIC PESTICIDES												
TOXAPHENE	10	0	0	10	0	0	7	0	0	9	0	0
2,4,5-T	1	0	0	2	0	0	.	.	.	.	.	.
2,4-D	1	0	0	2	0	0	.	.	.	.	.	.
2,4-DB	1	0	0	2	0	0	.	.	.	.	.	.
2,4 D PROPIONIC ACID	1	0	0	2	0	0	.	.	.	.	.	.
DICAMBA	1	0	0	2	0	0	.	.	.	.	.	.
PICHLORAM	0	0	0	0	0	0	.	.	.	.	.	.
SILVEX	1	0	0	2	0	0	.	.	.	.	.	.
DIAZINON	2	0	0	2	0	0	.	.	.	0	0	0
DICHLOROVOS	2	0	0	2	0	0	.	.	.	0	0	0
CHLORPYRIFOS	2	0	0	2	0	0	.	.	.	0	0	0
ETHION	2	0	0	2	0	0	.	.	.	0	0	0
AZINPHOS-METHYL	0	0	0	0	0	0	.	.	.	0	0	0
MALATHION	2	0	0	2	0	0	.	.	.	0	0	0
MEVINPHOS	2	0	0	2	0	0	.	.	.	0	0	0
METHYL PARATHION	2	0	0	2	0	0	.	.	.	0	0	0
METHYLTRITHION	2	0	0	2	0	0	.	.	.	0	0	0
PARATHION	2	0	0	2	0	0	.	.	.	0	0	0
PHORATE	2	0	0	2	0	0	.	.	.	0	0	0
RELDAN	2	0	0	2	0	0	.	.	.	0	0	0
RONNEL	2	0	0	2	0	0	.	.	.	0	0	0
AMINOCARB	0	0	0	0	0	0	.	.	.	.	.	.
BENONYL	0	0	0	0	0	0	.	.	.	.	.	.
BUX	0	0	0	0	0	0	.	.	.	.	.	.
CARBOFURAN	2	0	0	2	0	0	.	.	.	.	.	.
CICP	2	0	0	2	0	0	.	.	.	.	.	.
DIALATE	2	0	0	2	0	0	.	.	.	.	.	.

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM LINDSAY WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 3			SITE 2		
	TOTAL POSITIVE TRACE			TOTAL POSITIVE TRACE			TOTAL POSITIVE TRACE			TOTAL POSITIVE TRACE		
EPTAM	2	0	0	2	0	0	.	.	.	.	.	.
IPC	2	0	0	2	0	0	.	.	.	.	.	.
PROPOXUR	2	0	0	2	0	0	.	.	.	.	.	.
CARBARYL	2	0	0	2	0	0	.	.	.	.	.	.
BUTYLATE	2	0	0	2	0	0	.	.	.	.	.	.
*TOTAL SCAN SPECIFIC PESTICIDES	56	0	0	62	0	0	7	0	0	9	0	0
VOLATILES												
BENZENE	9	0	1	11	2	7	10	1	6	9	1	2
TOLUENE	9	0	0	11	1	3	10	1	4	9	1	2
ETHYLBENZENE	9	0	1	11	0	8	10	0	7	9	0	5
P-XYLENE	9	0	0	11	0	0	10	0	0	9	0	0
M-XYLENE	9	0	0	11	0	4	10	0	2	9	0	1
O-XYLENE	9	0	0	11	1	4	10	1	2	9	0	2
STYRENE	9	0	2	11	0	6	10	0	6	9	0	4
1,1 DICHLOROETHYLENE	9	0	0	11	0	0	10	0	0	9	0	0
METHYLENE CHLORIDE	9	0	0	11	0	0	10	0	0	9	0	0
1,1,2 DICHLOROETHYLENE	9	0	0	11	0	1	10	0	1	9	0	2
1,1 DICHLOROETHANE	9	0	0	11	0	0	10	0	0	9	0	0
CHLOROFORM	9	0	1	11	11	0	10	10	0	9	9	0
111, TRICHLOROETHANE	9	0	0	11	0	1	10	0	1	9	0	1
1,2 DICHLOROETHANE	9	0	0	11	0	0	10	0	0	9	0	0
CARBON TETRACHLORIDE	9	0	0	11	0	0	10	0	0	9	0	0
1,2 DICHLOROPROPANE	9	0	0	11	0	0	10	0	0	9	0	0
TRICHLOROETHYLENE	9	0	0	11	0	0	10	0	0	9	0	0
DICHLOROBROMOMETHANE	9	0	0	11	11	0	10	10	0	9	9	0
112 TRICHLOROETHANE	9	0	0	11	0	0	10	0	0	9	0	0
CHLORODIBROMOMETHANE	9	0	0	11	0	11	10	0	10	9	0	9
T-CHLOROETHYLENE	9	0	0	11	0	6	10	0	5	9	0	5
BROMOFORM	9	0	0	11	0	0	10	0	0	9	0	0
1122 T-CHLOROETHANE	9	0	0	11	0	0	10	0	0	9	0	0
CHLOROBENZENE	9	0	0	11	0	0	10	0	0	9	0	0
1,4 DICHLOROBENZENE	9	0	0	11	0	0	10	0	0	9	0	0
1,3 DICHLOROBENZENE	9	0	0	11	0	0	10	0	0	9	0	0
1,2 DICHLOROBENZENE	9	0	0	11	0	0	10	0	0	9	0	0
ETHYLENE DIBROMIDE	9	0	0	11	0	0	10	0	0	9	0	0
TOTL TRIHALOMETHANES	9	0	0	11	11	0	10	10	0	9	9	0
*TOTAL SCAN VOLATILES	261	0	5	319	37	51	290	33	44	261	29	33
*TOTAL GROUP ORGANIC	985	4	13	1068	42	64	561	34	47	605	30	38

KEY TO TABLE 5 and 6

- A** **ONTARIO DRINKING WATER OBJECTIVES (ODWO)**
1. Maximum Acceptable Concentration (MAC)
1+. MAC for Total Trihalomethanes
2. Interim Maximum Acceptable Concentration (IMAC)
3. Aesthetic Objective (AO)
3*. AO for Total Xylenes
4. Recommended Operational Guideline
- B** **HEALTH & WELFARE CANADA (H&W)**
1. Maximum Acceptable Concentration (MAC)
2. Proposed MAC
3. Interim MAC
4. Aesthetic Objective (AO)
- C** **WORLD HEALTH ORGANIZATION (WHO)**
1. Guideline Value (GV)
2. Tentative GV
3. Aesthetic GV
- D** **US ENVIRONMENTAL PROTECTION AGENCY (EPA)**
1. Maximum Contaminant Level (MCL)
2. Suggested No-Adverse Effect Level (SNAEL)
3. Lifetime Health Advisory
4. EPA Ambient Water Quality Criteria
4T. EPA Ambient Water Quality Criteria for Total PAH
- F** **EUROPEAN ECONOMIC COMMUNITY (EEC)**
1. Health Related Guideline Level
2. Aesthetic Guideline Level
3. Maximum Admissible Concentration (MADC)
- G** **CALIFORNIA STATE DEPARTMENT OF HEALTH-GUIDELINE VALUE**
- I** **NEW YORK STATE AMBIENT WATER GUIDELINE**
- N/A** **NONE AVAILABLE**

LABORATORY RESULTS, REMARK DESCRIPTIONS

.	No Sample Taken
BDL	Below Minimum Measurement Amount
<T	Greater Than Detection Limit But Not Confident (SEE INTERPRETATION OF RESULTS ABOVE)
>	Results Are Greater Than The Upper Limit
<=>	Approximate Result
!CS	No Data: Contamination Suspected
!IL	No Data: Sample Incorrectly Labelled
!IS	No Data: Insufficient Sample
!IV	No Data: Inverted Septum
!LA	No Data: Laboratory Accident
!LD	No Data: Test Queued After Sample Discarded
!NA	No Data: No Authorization To Perform Reanalysis
!NP	No Data: No Procedure
!NR	No Data: Sample Not Received
!OP	No Data: Obscured Plate
!QU	No Data: Quality Control Unacceptable
!PE	No Data: Procedural Error - Sample Discarded
!PH	No Data: Sample pH Outside Valid Range
!RE	No Data: Received Empty
!RO	No Data: See Attached Report (no numeric results)
!SM	No Data: Sample Missing
!SS	No Data: Send Separate Sample Properly Preserved
!UI	No Data: Indeterminant Interference
!TX	No Data: Time Expired
A3C	Approximate, Total Count Exceeded 300 Colonies
APL	Additional Peak, Large, Not Priority Pollutant
APS	Additional Peak, Less Than, Not Priority Pollutant
CIC	Possible Contamination, Improper Cap
CRO	Calculated Result Only
PPS	Test Performed On Preserved Sample
RMP	P and M-Xylene Not Separated
RRV	Rerun Verification
RVU	Reported Value Unusual
SPS	Several Peaks, Small, Not Priority Pollutant

UCR Unreliable: Could Not Confirm By Reanalysis
UCS Unreliable: Contamination Suspected
UIN Unreliable: Indeterminate Interference
XP Positive After X Number Of Hours
T# (T06) Result Taken After # Hours

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM LINDSAY WTP 1990

WATER TREATMENT PLANT

DISTRIBUTION SYSTEM

RAW		TREATED		SITE 3		SITE 2	
		STANDING		FREE FLOW		STANDING	
BACTERIOLOGICAL							
FECAL COLIFORM MF (CT/100ML)		DET'N LIMIT = 0		GUIDELINE = 0 (A1)			
FEB	12	.	.	.	.	.	.
MAR	BDL	.	.	.	.	.	.
APR	2	.	.	.	.	.	.
JUN	46	.	.	.	.	.	.
AUG	32	.	.	.	.	.	.
SEP	32	.	.	.	.	.	.
OCT	8	.	.	.	.	.	.
NOV	32	.	.	.	.	.	.
DEC	BDL	.	.	.	.	.	.
STANDRD PLATE CNT MF (COUNT/ML)		DET'N LIMIT = 0		GUIDELINE = 500/ML (A3)			
FEB	.	0 <=>	.	1 <=>	.	.	.
MAR	.	3 <=>	.	7 <=>	.	.	6 <=>
APR	.	23	.	.	.	.	510
MAY	.	.	.	.	.	.	69
JUN	.	0 <=>	.	29	.	.	13
AUG	.	370	.	360	.	.	510
SEP	.	4 <=>	.	270	.	.	.
OCT	.	1 <=>	.	7 <=>	.	.	12
NOV	.	2 <=>	.	1 <=>	.	.	3 <=>
DEC	.	0 <=>	.	0 <=>	.	.	3 <=>
TOTAL COLIFORM MF (CT/100ML)		DET'N LIMIT = 0		GUIDELINE = 5/100ML(A1)			
FEB	3200	.	.	.	.	.	.
MAR	1140	.	.	.	.	.	.
APR	20 <=>	.	.	.	.	.	.
JUN	BDL	.	.	.	.	.	.
AUG	BDL	.	.	.	.	.	.
SEP	80 <=>	.	.	.	.	.	.
OCT	200	.	.	.	.	.	.
NOV	5900	.	.	.	.	.	.
DEC	80 <=>	.	.	.	.	.	.
T COLIFORM BCKGRD MF (CT/100ML)		DET'N LIMIT = 0		GUIDELINE = N/A			
FEB	43000	.	.	.	.	.	.
MAR	3220	.	.	.	.	.	.
APR	48000 >	.	.	.	.	.	.
JUN	40000 >	.	.	.	.	.	.
AUG	48000 >	.	.	.	.	.	.
SEP	24000	.	.	.	.	.	.
OCT	16667	.	.	.	.	.	.
NOV	19000	.	.	.	.	.	.
DEC	1560	.	.	.	.	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM LINDSAY WTP 1990

WATER TREATMENT PLANT

DISTRIBUTION SYSTEM

RAW		TREATED		SITE 3		SITE 2	
		STANDING		FREE FLOW		STANDING	
CHEMISTRY (FLD)		DET'N LIMIT = 0		GUIDELINE = N/A			
FLD CHLORINE (COMB) (MG/L)							
FEB	.800	.300	.300	.300	.050	1.000	.
MAR	.500	.400	1.100	.100	.100	.100	.
APR	.400	.100	.300	.100	.100	.200	.
MAY	.300	.	.	.100	.100	.200	.
JUN	.700	.100	.300	.100	.100	.100	.
JUL	.300	.200	.200	.100	.100	.100	.
AUG	.600	.200	.100	.100	.100	.100	.
SEP	.200	.100	.200	.100	.100	.100	.
OCT	.200	.200	.100	.100	.100	.100	.
NOV	.000	.200	.200	.100	.100	.100	.
DEC	.400	.300	.500	.190	.190	.500	.
FLD CHLORINE FREE (MG/L)		DET'N LIMIT = 0		GUIDELINE = N/A			
FEB	.900	.100	.300	.000	.000	.100	.
MAR	.200	.200	.000	.000	.000	.100	.
APR	.500	.100	.000	.000	.000	.000	.
MAY	.200	.	.	.000	.000	.000	.
JUN	.300	.000	.000	.000	.000	.000	.
JUL	1.500	.000	.100	.000	.000	.000	.
AUG	.900	.000	.300	.000	.000	.100	.
SEP	1.500	.000	.100	.000	.000	.000	.
OCT	1.700	.300	.400	.010	.010	.010	.
NOV	1.900	.300	.900	.000	.000	.250	.
DEC	1.300	.300	.400	.010	.010	.100	.
FLD CHLORINE (TOTAL) (MG/L)		DET'N LIMIT = 0		GUIDELINE = N/A			
FEB	1.700	.400	.600	.050	1.100	.200	.
MAR	.700	.600	1.100	.100	.100	.200	.
APR	.900	.200	.300	.100	.100	.200	.
MAY	.500	.	.	.100	.100	.200	.
JUN	1.000	.100	.300	.100	.100	.200	.
JUL	1.800	.200	.300	.010	.100	.200	.
AUG	1.500	.200	.400	.100	.100	.200	.
SEP	1.700	.100	.300	.	.	.	.
OCT	1.900	.500	.500	.100	.200	.200	.
NOV	1.900	.500	1.100	.100	.950	.600	.
DEC	1.700	.600	.900	.200	.	.	.
FLD PH (DMNSLESS)		DET'N LIMIT = N/A		GUIDELINE = 6.5-8.5(A4)			
FEB	7.300	6.900	6.900	6.900	.	.	.
MAR	7.600	6.800	6.800	6.800	6.800	6.900	.
APR	7.800	7.300	7.100	6.900	7.000	7.100	.
MAY	8.000	7.100	.	.	7.100	7.300	.
JUN	7.600	6.800	7.000	7.100	7.000	6.900	.
JUL	7.600	6.800	6.900	6.900	6.800	6.800	.
AUG	7.700	6.900	6.700	6.800	6.900	6.800	.
SEP	7.700	7.100	6.900	6.900	.	.	.
OCT	7.700	6.900	6.900	6.800	6.900	6.800	.
NOV	7.800	7.000	7.000	6.800	7.000	6.900	.
DEC	7.700	7.000	6.900	7.000	7.000	7.100	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM LINDSAY WTP 1990

WATER TREATMENT PLANT

DISTRIBUTION SYSTEM

RAW

TREATED

SITE 3

SITE 2

STANDING

FREE FLOW

STANDING

FREE FLOW

FLD TEMPERATURE (DEG.C)

DET'N LIMIT = N/A

GUIDELINE = 15 (A3)

FEB	1.000	2.000	19.000	4.000	.	.
MAR	2.500	3.000	17.000	4.000	18.000	8.500
APR	13.000	12.000	16.000	6.000	20.000	9.000
MAY	19.000	18.500	.	.	21.000	13.000
JUN	21.000	20.000	19.000	14.500	21.000	17.000
JUL	26.000	26.000	19.000	19.000	21.500	20.000
AUG	25.000	25.000	20.000	19.000	23.000	19.000
SEP	14.000	14.000	18.500	17.000	.	.
OCT	11.500	10.000	16.000	13.500	22.000	15.000
NOV	4.000	2.500	18.000	10.000	22.000	12.000
DEC	2.000	1.000	12.000	6.500	21.000	10.000

FLD TURBIDITY (FTU)

DET'N LIMIT = N/A

GUIDELINE = 1 (A1)

FEB	3.400	.800	.600	.700	.	.
MAR	9.000	.440	.220	.350	.610	.960
APR	4.220	.420	.500	.800	.600	.600
MAY	3.320	.880	.	.	1.100	1.400
JUN	10.200	.520	.900	.700	3.300	.800
JUL	14.300	.500	.660	.630	.830	.800
AUG	10.110	.350	.540	.380	.640	.550
SEP	5.330	.450	.530	.610	.	.
OCT	10.700	.140	.310	.330	.840	.750
NOV	2.840	.	.680	.500	.800	1.600
DEC	3.000	.310	1.160	.470	1.060	.680

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM LINDSAY WTP 1990

WATER TREATMENT PLANT

DISTRIBUTION SYSTEM

RAW

TREATED

SITE 3

SITE 2

STANDING

FREE FLOW

STANDING

FREE FLOW

CHEMISTRY (LAB)

ALKALINITY (MG/L)

DET'N LIMIT = 0.2

GUIDELINE = 30-500 (A4)

FEB	157.600	111.400	106.900	106.900	.	.
MAR	127.400	77.400	75.800	78.000	78.500	86.500
APR	160.300	121.400	120.800	117.600	118.500	122.200
MAY	218.300	169.200	.	.	171.600	172.200
JUN	189.400	143.600	144.900	143.400	143.400	143.900
JUL	123.400	82.400	82.200	83.100	87.800	88.900
AUG	107.800	64.700	66.200	66.300	66.900	66.800
SEP	124.600	96.400	95.300	95.100	.	.
OCT	117.600	67.100	79.800	77.400	75.200	75.400
NOV	176.300	119.200	114.800	125.400	121.500	133.800
DEC	151.900	116.800	115.500	.	111.700	112.500

CALCIUM (MG/L)

DET'N LIMIT = 0.2

GUIDELINE = 100 (F2)

FEB	66.000	64.000	62.800	63.600	.	.
MAR	52.800	51.000	52.200	52.400	53.200	52.800
APR	67.200	66.600	67.800	67.400	67.600	69.800
MAY	84.800	84.700	.	.	89.100	88.300
JUN	74.200	76.200	75.200	75.200	74.400	73.600
JUL	45.400	46.400	46.800	46.600	48.400	48.600
AUG	40.500	40.700	42.100	43.100	42.700	42.600
SEP	49.800	47.800	48.000	48.000	.	.
OCT	47.900	47.500	52.900	50.500	49.700	51.100
NOV	77.900	72.300	72.300	74.900	75.000	75.700
DEC	58.200	59.600	58.000	.	59.000	57.000

CYANIDE (MG/L)

DET'N LIMIT = 0.001

GUIDELINE = .2 (A1)

FEB	BDL	.002 <T	.	.	.	.
MAR	BDL	BDL	.	.	.	.
APR	BDL	BDL	.	.	.	.
MAY	BDL	BDL	.	.	.	.
JUN	BDL	BDL	.	.	.	.
JUL	BDL	BDL	.	.	.	.
AUG	BDL	BDL	.	.	.	.
SEP	BDL	BDL	.	.	.	.
OCT	BDL	BDL	.	.	.	.
NOV	BDL	BDL	.	.	.	.
DEC	BDL	BDL	.	.	.	.

CHLORIDE (MG/L)

DET'N LIMIT = 0.2

GUIDELINE = 250 (A3)

FEB	19.800	24.400	24.400	24.300	.	.
MAR	15.000	15.000	14.400	16.500	13.800	17.400
APR	12.900	20.000	20.100	20.200	20.600	21.100
MAY	18.500	21.000	.	.	21.700	21.100
JUN	18.600	24.000	24.400	24.500	25.400	24.500
JUL	15.800	19.800	20.000	20.100	20.800	20.600
AUG	15.600	18.800	18.200	18.300	18.900	18.700
SEP	18.100	20.600	20.700	20.300	.	.
OCT	16.800	20.400	21.100	20.600	21.000	20.900
NOV	22.300	26.800	26.400	26.200	26.300	26.200
DEC	20.000	23.300	24.800	.	26.300	25.200

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM LINDSAY WTP 1990

WATER TREATMENT PLANT

DISTRIBUTION SYSTEM

RAW		TREATED		SITE 3		SITE 2	
				STANDING	FREE FLOW	STANDING	FREE FLOW
COLOUR (HZU)		DET'N LIMIT = 0.5		GUIDELINE = 5 (A3)			
FEB	27.000	4.000	4.000	4.000	.	.	.
MAR	26.000	2.500	3.500	3.000	5.000	6.500	.
APR	29.500	7.000	7.000	6.000	7.000	7.500	.
MAY	57.000	14.000	.	.	15.500	17.000	.
JUN	45.500	13.000	14.000	13.000	13.500	15.500	.
JUL	21.500	4.500	5.000	5.000	7.000	7.000	.
AUG	14.000	2.000 <T	2.500	3.000	5.000	4.500	.
SEP	17.500	4.500	5.000	4.500	.	.	.
OCT	10.000	1.500 <T	3.000	2.500	7.000	9.000	.
NOV	25.500	3.000	3.500	5.000	7.000	7.500	.
DEC	14.000	3.000	3.000	.	3.000	5.000	.
CONDUCTIVITY (UMHO/CM)		DET'N LIMIT = 1.		GUIDELINE = 400 (F2)			
FEB	416	441	442	439	.	.	.
MAR	329	343	343	345	350	351	.
APR	394	419	422	421	430	433	.
MAY	485	512	.	.	517	516	.
JUN	426	452	455	456	457	457	.
JUL	312	343	342	343	351	354	.
AUG	287	309	310	311	310	311	.
SEP	324	337	341	322	.	.	.
OCT	315	352	376	367	366	371	.
NOV	451	471	466	474	472	476	.
DEC	391	408	417	.	414	407	.
DISS ORG CARBON (MG/L)		DET'N LIMIT = .100		GUIDELINE = 5.0 (A3)			
FEB	8.500	4.500	4.300	4.000	.	.	.
MAR	7.300	3.400	3.300	3.400	3.300	3.500	.
APR	7.800	4.800	4.400	4.400	4.300	4.300	.
MAY	11.700	6.800	.	.	6.600	6.700	.
JUN	11.900	7.600	7.500	7.300	7.300	7.300	.
JUL	10.700	5.900	5.800	5.900	5.800	5.900	.
AUG	9.100	4.400	4.300	4.300	4.200	4.400	.
SEP	8.900	6.000	5.700	5.900	.	.	.
OCT	11.300	4.100	4.400	4.300	4.200	4.200	.
NOV	10.000	5.200	5.100	5.500	5.300	5.700	.
DEC	10.100	6.000	6.700	.	5.900	5.600	.
FLUORIDE (MG/L)		DET'N LIMIT = 0.01		GUIDELINE = 2.4 (A1)			
FEB	.060	BDL	.020 <T	.020 <T	.	.	.
MAR	.060	.020 <T	.020 <T	.020 <T	.020 <T	.020 <T	.
APR	.060	.040 <T	.020 <T	.020 <T	.040 <T	.040 <T	.
MAY	.080	.060	.	.	.040 <T	.040 <T	.
JUN	.080	.060	.060	.040 <T	.060	.060	.
JUL	.080	.060	.060	.040 <T	.040 <T	.060	.
AUG	.040 <T	.040 <T	.020 <T	.040 <T	.040 <T	.020 <T	.
SEP	.080	.060	.060	.060	.	.	.
OCT	.060	.020 <T	.020 <T	.020 <T	.020 <T	.020 <T	.
NOV	.060	.020 <T	.040 <T	.040 <T	.040 <T	.040 <T	.
DEC	.080	.060	.060	.	.040 <T	.040 <T	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM LINDSAY WTP 1990

WATER TREATMENT PLANT

DISTRIBUTION SYSTEM

RAW TREATED SITE 3 SITE 2

STANDING

FREE FLOW

STANDING

FREE FLOW

HARDNESS (MG/L)

DET'N LIMIT = 0.5

GUIDELINE = 80-100 (A4)

FEB	195.000	190.000	187.000	189.000	155.000	155.000
MAR	155.000	150.000	152.000	153.000	197.000	203.000
APR	195.000	194.000	197.000	197.000	256.300	254.400
MAY	246.500	246.100	.	.	222.700	219.600
JUN	221.000	226.300	224.100	223.800	151.000	150.000
JUL	144.000	146.000	146.000	146.000	135.800	134.900
AUG	131.800	130.300	134.300	136.800	.	.
SEP	160.000	154.000	154.000	154.000	153.000	157.100
OCT	147.900	146.700	163.000	155.800	223.300	226.600
NOV	231.600	217.100	217.000	223.000	180.000	175.000
DEC	178.000	181.000	178.000	.	.	.

IONCAL (DMNSLESS)

DET'N LIMIT = N/A

GUIDELINE = N/A

FEB	.948	1.274	2.503	1.461	.	.
MAR	2.437	.536	2.389	1.067	2.858	2.350
APR	5.325	.147	1.365	1.242	.260	1.339
MAY	.257	2.125	.	.	.776	.436
JUN	5.179	6.239	4.749	4.265	3.846	2.881
JUL	2.160	1.995	.859	1.956	.954	2.725
AUG	3.626	.085	1.695	3.231	2.686	1.886
SEP	7.424	3.086	1.566	3.700	.	.
OCT	3.415	1.254	1.421	.827	1.054	1.735
NOV	6.060	2.655	4.579	4.534	5.725	3.742
DEC	4.585	.980	6.298	.000	2.790	4.600

LANGELIERS INDEX (DMNSLESS)

DET'N LIMIT = N/A

GUIDELINE = N/A

FEB	.714	.198	.042	-.072	.	.
MAR	.484	-.499	-.588	-.574	-.475	-.437
APR	.922	.625	.330	.286	.670	.567
MAY	.248	.324	.	.	.682	.600
JUN	1.104	.903	.841	.816	.811	.768
JUL	.446	.077	-.040	-.107	.142	-.001
AUG	.366	-.132	-.177	-.136	-.026	.042
SEP	.649	.229	.175	.056	.	.
OCT	.488	-.173	-.073	-.056	-.085	-.202
NOV	.972	.227	.112	.194	.202	.277
DEC	.676	.121	.113	.	.386	-.075

MAGNESIUM (MG/L)

DET'N LIMIT = 0.10

GUIDELINE = 30 (F2)

FEB	7.400	7.300	7.300	7.400	.	.
MAR	5.500	5.500	5.300	5.500	5.500	5.600
APR	6.600	6.700	6.700	6.800	6.900	6.900
MAY	8.450	8.450	.	.	8.200	8.200
JUN	8.650	8.750	8.850	8.750	9.000	8.700
JUL	7.400	7.200	7.200	7.100	7.400	7.100
AUG	7.450	7.000	7.050	7.050	7.100	6.900
SEP	8.600	8.400	8.400	8.400	.	.
OCT	6.900	6.850	7.500	7.200	7.050	7.150
NOV	9.000	8.850	8.900	8.750	8.750	9.100
DEC	7.900	7.900	8.000	.	8.000	7.900

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM LINDSAY WTP 1990

WATER TREATMENT PLANT

DISTRIBUTION SYSTEM

RAW

TREATED

SITE 3

SITE 2

		STANDING		FREE FLOW		STANDING		FREE FLOW	
SODIUM (MG/L)		DET'N LIMIT = 0.2		GUIDELINE = 200 (A4)					
FEB	9.200	11.000	11.200	10.800	.	7.200	.	7.000	.
MAR	7.400	7.000	6.800	7.200	9.200	9.200	9.200	9.200	9.200
APR	8.000	9.200	9.200	9.000	.	8.500	.	8.500	.
MAY	8.100	8.300	.	.	10.100	10.100	10.100	10.200	10.200
JUN	8.700	10.000	10.100	9.900	8.800	9.000	8.800	8.800	8.800
JUL	7.600	8.400	8.800	8.800	8.500	8.500	8.500	8.500	8.500
AUG	8.100	8.300	8.000	8.000	.	.	.	.	.
SEP	8.000	8.200	8.000	8.400	9.600	9.600	9.800	9.800	9.800
OCT	8.500	9.500	9.700	9.500	11.700	11.700	11.700	11.700	11.700
NOV	10.000	11.900	11.900	11.800	10.600	10.600	10.000	10.000	10.000
DEC	8.000	9.400	9.600	.	.	.	.	.	.
AMMONIUM TOTAL (MG/L)		DET'N LIMIT = 0.002		GUIDELINE = 0.05 (F2)					
FEB	.216	BDL	.098	BDL	.	.	.	.	.
MAR	.282	.024	.010	.022	.154	.154	.064	.064	.064
APR	.044	BDL	.020	BDL	.246	.246	BDL	BDL	BDL
MAY	.066	.002 <T	.	.	BDL	BDL	.012	.012	.012
JUN	.168	.006 <T	.014	.008 <T	BDL	BDL	.014	.014	.014
JUL	.190	.012	.024	.024	.012	.012	.032	.032	.032
AUG	.164	.012	.016	.006 <T	.016	.016	.016	.016	.016
SEP	.098	.006 <T	.012	.010	.	.	.	.	.
OCT	.028	.004 <T	.016	.008 <T	.022	.022	.018	.018	.018
NOV	.040	.024	.032	.024	.032	.032	.026	.026	.026
DEC	.010	.008 <T	.032	.	.012	.012	.012	.012	.012
NITRITE (MG/L)		DET'N LIMIT = 0.001		GUIDELINE = 1 (A1)					
FEB	.012	BDL	.001 <T	BDL	.	.	.	.	.
MAR	.013	.007	.004 <T	.006	.007	.007	.004 <T	.004 <T	.004 <T
APR	.011	BDL	.002 <T	.002 <T	.001 <T	.001 <T	.001 <T	.001 <T	.001 <T
MAY	.012	.002 <T	.	.	.002 <T	.002 <T	.002 <T	.002 <T	.002 <T
JUN	.019	.016	.013	.017	.019	.019	.019	.019	.019
JUL	.004 <T	.001 <T	.002 <T	.002 <T	.002 <T	.002 <T	.003 <T	.003 <T	.003 <T
AUG	.004 <T	.002 <T	.002 <T	.002 <T	.002 <T	.002 <T	.003 <T	.003 <T	.003 <T
SEP	.004 <T	.001 <T	.003 <T	.002 <T	.	.	.	.	.
OCT	.006	BDL	.001 <T	.001 <T	.002 <T	.002 <T	.002 <T	.002 <T	.002 <T
NOV	.032	.013	.019	.013	.029	.029	.012	.012	.012
DEC	.002 <T	.001 <T	.002 <T	.	.003 <T	.003 <T	.002 <T	.002 <T	.002 <T
TOTAL NITRATES (MG/L)		DET'N LIMIT = 0.005		GUIDELINE = 10 (A1)					
FEB	.900	.870	.985	.840	.	.	.	.	.
MAR	.615	.645	.645	.655	1.090	1.090	.710	.710	.710
APR	.885	.910	.915	.880	1.510	1.510	.945	.945	.945
MAY	.660	.685	.	.	.755	.755	.650	.650	.650
JUN	.080	.095	.085	.090	.155	.155	.080	.080	.080
JUL	.010 <T	.015 <T	.005 <T	.005 <T	.005 <T	.005 <T	.005 <T	.005 <T	.005 <T
AUG	.065	.020 <T	.030	.020 <T	.070	.070	.015 <T	.015 <T	.015 <T
SEP	.005 <T	BDL	BDL	BDL	.	.	.	.	.
OCT	.075	.085	.140	.120	.175	.175	.135	.135	.135
NOV	.835	.780	.750	.805	.860	.860	.880	.880	.880
DEC	.560	.560	.570	.	.575	.575	.540	.540	.540

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM LINDSAY WTP 1990

WATER TREATMENT PLANT

DISTRIBUTION SYSTEM

RAW

TREATED

SITE 3

SITE 2

STANDING

FREE FLOW

STANDING

FREE FLOW

NITROGEN TOT KJELD (MG/L)		DET'N LIMIT = 0.02		GUIDELINE = N/A	
FEB	1.010	.430	.560	.420	.
MAR	.950	.370	.370	.390	.580
APR	.740	.460	.580	.400	.750
MAY	.870	.550	.	.	.570
JUN	1.120	.630	.620	.600	.690
JUL	.950	.530	.500	.510	.500
AUG	1.070	.390	.360	.350	.370
SEP	.880	.510	.480	.	.
OCT	1.000	.330	.360	.360	.370
NOV	.490	.500	.800	.460	.510
DEC	.880	.480	.710	.	.500
PH (DMNSLESS)		DET'N LIMIT = N/A		GUIDELINE = 6.5-8.5(A4)	
FEB	8.150	7.800	7.670	7.550	.
MAR	8.100	7.350	7.260	7.260	7.350
APR	8.340	8.170	7.870	7.840	8.220
MAY	7.440	7.630	.	.	7.960
JUN	8.410	8.320	8.260	8.240	8.240
JUL	8.140	7.940	7.820	7.750	7.960
AUG	8.160	7.890	7.820	7.850	7.960
SEP	8.300	8.010	7.960	7.840	.
OCT	8.180	7.770	7.750	7.800	7.790
NOV	8.290	7.750	7.650	7.680	7.700
DEC	8.180	7.730	7.740	.	8.020
PHOSPHORUS FIL REACT (MG/L)		DET'N LIMIT = 0.0005		GUIDELINE = N/A	
FEB	.001 <T	BDL	.	.	.
MAR	.006	.000 <T	.	.	.
APR	.001 <T	BDL	.	.	.
MAY	.001 <T	.000 <T	.	.	.
JUN	.000 <T	BDL	.	.	.
JUL	.003	.000 <T	.	.	.
AUG	.005	.001 <T	.	.	.
SEP	BDL	BDL	.	.	.
OCT	.006	.001 <T	.	.	.
NOV	.001 <T	BDL	.	.	.
DEC	.000 <T	BDL	.	.	.
PHOSPHORUS TOTAL (MG/L)		DET'N LIMIT = 0.002		GUIDELINE = .40 (F2)	
FEB	.027	.003 <T	.	.	.
MAR	.049	.007 <T	.	.	.
APR	.025	.007 <T	.	.	.
MAY	.023	.004 <T	.	.	.
JUN	.047	.009 <T	.	.	.
JUL	.058	.010	.	.	.
AUG	.050	.006 <T	.	.	.
SEP	.044	.013	.	.	.
OCT	.059	.020	.	.	.
NOV	.003 <T	.003 <T	.	.	.
DEC	.021	.004 <T	.	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM LINDSAY WTP 1990

WATER TREATMENT PLANT

DISTRIBUTION SYSTEM

RAW		TREATED	SITE 3		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
SULPHATE (MG/L)			DET'N LIMIT = .200	GUIDELINE = 500 (A3)		
FEB	24.210	64.850	69.130	68.810	.	.
MAR	16.030	62.700	62.080	61.260	62.450	58.330
APR	19.230	58.220	59.120	61.390	63.000	61.790
MAY	17.590	65.930	.	.	64.960	64.580
JUN	12.040	53.380	53.140	54.680	53.630	53.990
JUL	11.380	54.390	54.420	54.280	53.150	54.200
AUG	14.070	54.800	54.780	54.740	54.240	54.910
SEP	14.400	39.500	42.900	41.100	.	.
OCT	18.690	66.430	68.590	68.130	67.620	67.180
NOV	27.030	73.760	74.670	69.840	70.740	66.250
DEC	21.180	50.020	56.380	.	55.800	53.470
TURBIDITY (FTU)			DET'N LIMIT = 0.05	GUIDELINE = 1 (A1)		
FEB	4.200	1.100	1.100	.960	.	.
MAR	8.800	.790	.940	.960	1.100	.990
APR	3.500	.850	.950	.930	.780	.870
MAY	4.300	1.000	.	.	1.180	1.220
JUN	12.500	.790	.860	.710	3.000	1.120
JUL	16.500	.690	1.100	1.100	1.000	.990
AUG	10.400	.740	.990	.760	.800	.870
SEP	10.300	.960	.760	.730	.	.
OCT	11.000	.530	.840	.470	.840	.930
NOV	4.400	.560	1.100	1.100	1.100	1.000
DEC	4.400	1.200	1.800	.	.830	1.000

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM LINDSAY WTP 1990

WATER TREATMENT PLANT

DISTRIBUTION SYSTEM

RAW		TREATED		SITE 3		SITE 2	
				STANDING	FREE FLOW	STANDING	FREE FLOW
SILVER (UG/L)		METALS		DET'N LIMIT = 0.05		GUIDELINE = 50 (A1)	
FEB	BDL	BDL	.060 <T	BDL	BDL	BDL	BDL
MAR	BDL	BDL	BDL	BDL	BDL	BDL	BDL
APR	BDL	BDL	BDL	BDL	BDL	BDL	BDL
MAY	BDL	BDL	BDL	BDL	BDL	BDL	BDL
JUN	BDL	BDL	BDL	BDL	BDL	BDL	BDL
JUL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
AUG	BDL	BDL	BDL	BDL	BDL	BDL	BDL
SEP	BDL	BDL	BDL	BDL	BDL	BDL	BDL
OCT	BDL	BDL	BDL	BDL	BDL	BDL	BDL
NOV	BDL	BDL	BDL	BDL	BDL	BDL	BDL
DEC	BDL	BDL	BDL	BDL	BDL	BDL	BDL
ALUMINUM (UG/L)				DET'N LIMIT = 0.10		GUIDELINE = 100 (A4)	
FEB	54.000	430.000	210.000	230.000	130.000	170.000	
MAR	120.000	100.000	120.000	140.000	150.000	130.000	
APR	55.000	240.000	190.000	170.000	280.000	340.000	
MAY	56.000	350.000	180.000	200.000	790.000	200.000	
JUN	100.000	170.000	150.000	160.000	160.000	150.000	
JUL	210.000	160.000	44.000	48.000	56.000	47.000	
AUG	84.000	56.000	150.000	160.000	70.000	84.000	
SEP	86.000	200.000	84.000	83.000	200.000	280.000	
OCT	61.000	77.000	180.000	230.000	190.000	190.000	
NOV	28.000	200.000	250.000	250.000			
DEC	15.000	290.000					
ARSENIC (UG/L)				DET'N LIMIT = 0.10		GUIDELINE = 25 (A1)	
FEB	.390 <T	.370 <T	.460 <T	.330 <T	BDL	.180 <T	
MAR	.320 <T	.140 <T	BDL	BDL	.250 <T	.130 <T	
APR	.150 <T	BDL	BDL	.130 <T	.560 <T	.550 <T	
MAY	.640 <T	.570 <T	.460 <T	.360 <T	.360 <T	.440 <T	
JUN	.520 <T	.460 <T	.480 <T	.480 <T	.490 <T	.660 <T	
JUL	.630 <T	.450 <T	.520 <T	.430 <T	.480 <T	.290 <T	
AUG	.570 <T	.340 <T	.580 <T	.540 <T			
SEP	.630 <T	.550 <T	.290 <T	.430 <T	.320 <T	.410 <T	
OCT	.590 <T	.370 <T	BDL	BDL	BDL	BDL	
NOV	.220 <T	BDL	.530 <T	.330 <T	.210 <T	.290 <T	
DEC	.350 <T	.280 <T					
BARIUM (UG/L)				DET'N LIMIT = 0.05		GUIDELINE = 1000 (A2)	
FEB	32.000	27.000	27.000	26.000	23.000	21.000	
MAR	24.000	20.000	22.000	22.000	29.000	28.000	
APR	32.000	26.000	27.000	27.000	34.000	32.000	
MAY	37.000	33.000	34.000	34.000	35.000	34.000	
JUN	38.000	33.000	29.000	28.000	29.000	29.000	
JUL	34.000	28.000	24.000	24.000	25.000	24.000	
AUG	26.000	24.000	25.000	24.000			
SEP	28.000	25.000	28.000	28.000	29.000	28.000	
OCT	29.000	27.000	28.000	27.000	28.000	26.000	
NOV	35.000	28.000	27.000	26.000	27.000	24.000	
DEC	28.000	26.000					

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM LINDSAY WTP 1990

WATER TREATMENT PLANT

DISTRIBUTION SYSTEM

RAW

TREATED

SITE 3

SITE 2

		STANDING		FREE FLOW		STANDING		FREE FLOW	
BORON (UG/L)		DET'N LIMIT = 2.00		GUIDELINE = 5000 (A1)					
FEB	24.000	21.000	22.000	24.000		9.100	<T	8.500	<T
MAR	14.000 <T	13.000 <T	8.600 <T	8.700 <T		39.000		86.000	
APR	43.000	71.000	71.000	73.000		89.000		94.000	
MAY	80.000	77.000				26.000		25.000	
JUN	25.000	23.000	25.000	25.000		34.000		34.000	
JUL	29.000	24.000	23.000	32.000		26.000		27.000	
AUG	25.000	24.000	25.000	25.000					
SEP	37.000	27.000	36.000	39.000					
OCT	18.000 <T	19.000 <T	20.000 <T	19.000 <T		19.000	<T	14.000	<T
NOV	12.000 <T	11.000 <T	12.000 <T	13.000 <T		13.000	<T	10.000	<T
DEC	11.000 <T	12.000 <T	44.000	18.000 <T		19.000	<T	12.000	<T
BERYLLIUM (UG/L)		DET'N LIMIT = 0.05		GUIDELINE = 6800 (D4)					
FEB	BDL	BDL	BDL	BDL		BDL		BDL	
MAR	BDL	BDL	BDL	BDL		BDL		BDL	
APR	BDL	.090 <T	BDL	.160 <T		BDL		.110	<T
MAY	.060 <T	BDL				.080	<T	.120	<T
JUN	BDL	BDL	BDL	BDL		BDL		BDL	
JUL	BDL	BDL	BDL	BDL		.070	<T	BDL	
AUG	BDL	BDL	BDL	BDL		BDL		BDL	
SEP	BDL	BDL	BDL	BDL					
OCT	BDL	BDL	BDL	BDL		BDL		BDL	
NOV	BDL	BDL	BDL	BDL		BDL		BDL	
DEC	BDL	BDL	BDL	BDL		BDL		BDL	
CADMIUM (UG/L)		DET'N LIMIT = 0.05		GUIDELINE = 5 (A1)					
FEB	BDL	BDL	BDL	BDL		BDL		BDL	
MAR	BDL	BDL	BDL	BDL		BDL		BDL	
APR	BDL	BDL	.080 <T	BDL		BDL		BDL	
MAY	BDL	BDL				BDL		BDL	
JUN	BDL	BDL	.100 <T	BDL		BDL		BDL	
JUL	BDL	BDL	BDL	BDL		BDL		BDL	
AUG	BDL	BDL	BDL	BDL		BDL		BDL	
SEP	BDL	BDL	BDL	BDL					
OCT	BDL	BDL	BDL	BDL		BDL		BDL	
NOV	BDL	BDL	BDL	BDL		BDL		BDL	
DEC	BDL	BDL	.130 <T	BDL		BDL		BDL	
COBALT (UG/L)		DET'N LIMIT = 0.02		GUIDELINE = N/A					
FEB	.070 <T	BDL	BDL	BDL		BDL		BDL	
MAR	.080 <T	.070 <T	.080 <T	BDL		BDL		BDL	
APR	.160 <T	BDL	BDL	BDL		.180	<T	BDL	
MAY	.290 <T	.290 <T				.600	<T	.210	<T
JUN	.270 <T	.290 <T	.260 <T	.210 <T		.300	<T	.230	<T
JUL	.160 <T	.060 <T	BDL	BDL		BDL		BDL	
AUG	.050 <T	BDL	BDL	.050 <T		.230	<T	BDL	
SEP	.130 <T	.080 <T	.100 <T	.080 <T					
OCT	.470 <T	.130 <T	.110 <T	.080 <T		.200	<T	.080	<T
NOV	.060 <T	.120 <T	.130 <T	.100 <T		.210	<T	.070	<T
DEC	.140 <T	.060 <T	.100 <T	.060 <T		BDL		.070	<T

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM LINDSAY WTP 1990

WATER TREATMENT PLANT				DISTRIBUTION SYSTEM		
RAW	TREATED	SITE 3		SITE 2		
		STANDING	FREE FLOW	STANDING	FREE FLOW	
CHROMIUM (UG/L)		DET'N LIMIT = 0.50		GUIDELINE = 50 (A1)		
FEB	2.800 <T	3.800 <T	3.000 <T	3.900 <T	.	.
MAR	1.500 <T	1.600 <T	BDL	.560 <T	.700 <T	.660 <T
APR	2.200 <T	5.000 <T	4.400 <T	4.900 <T	2.600 <T	5.800
MAY	4.000 <T	4.700 <T	.	.	5.300	5.400
JUN	3.800 <T	3.400 <T	4.000 <T	3.700 <T	4.400 <T	4.000 <T
JUL	2.100 <T	1.900 <T	2.000 <T	2.900 <T	3.100 <T	3.300 <T
AUG	1.300 <T	1.500 <T	1.300 <T	1.000 <T	1.200 <T	1.300 <T
SEP	7.100	4.000 <T	6.900	7.500	.	.
OCT	2.600 <T	4.000 <T	3.900 <T	3.700 <T	3.100 <T	.950 <T
NOV	1.700 <T	1.400 <T	1.800 <T	2.200 <T	2.100 <T	1.200 <T
DEC	BDL	1.100 <T	3.200 <T	3.300 <T	3.200 <T	.720 <T
COPPER (UG/L)		DET'N LIMIT = 0.50		GUIDELINE = 1000 (A3)		
FEB	4.100 <T	3.500 <T	73.000	13.000	.	.
MAR	4.500 <T	2.700 <T	110.000	14.000	120.000	110.000
APR	3.400 <T	2.300 <T	140.000	13.000	130.000	91.000
MAY	1.600 <T	2.200 <T	.	.	120.000	50.000
JUN	1.200 <T	2.000 <T	130.000	13.000	150.000	64.000
JUL	1.900 <T	1.200 <T	120.000	15.000	160.000	65.000
AUG	.950 <T	1.100 <T	270.000	36.000	180.000	140.000
SEP	.820 <T	.860 <T	210.000	23.000	.	.
OCT	1.100 <T	1.400 <T	70.000	30.000	170.000	99.000
NOV	1.200 <T	1.000 <T	510.000	37.000	160.000	87.000
DEC	.740 <T	1.400 <T	110.000	23.000	130.000	82.000
IRON (UG/L)		DET'N LIMIT = 6.00		GUIDELINE = 300 (A3)		
FEB	82.000	12.000 <T	22.000 <T	38.000 <T	.	.
MAR	110.000	BDL	17.000 <T	27.000 <T	58.000 <T	100.000
APR	82.000	BDL	39.000 <T	13.000 <T	50.000 <T	60.000 <T
MAY	90.000	BDL	.	.	63.000	110.000
JUN	180.000	9.200 <T	49.000 <T	29.000 <T	220.000	150.000
JUL	320.000	BDL	25.000 <T	43.000 <T	120.000	110.000
AUG	140.000	6.200 <T	16.000 <T	32.000 <T	110.000	100.000
SEP	170.000	26.000 <T	27.000 <T	35.000 <T	.	.
OCT	78.000	BDL	28.000 <T	26.000 <T	230.000	310.000
NOV	35.000 <T	BDL	16.000 <T	17.000 <T	76.000	47.000 <T
DEC	28.000 <T	14.000 <T	28.000 <T	22.000 <T	70.000	190.000
MERCURY (UG/L)		DET'N LIMIT = 0.02		GUIDELINE = 1 (A1)		
FEB	.100 <T	.050 <T	.	.	.	.
MAR	BDL	BDL	.	.	.	.
APR	BDL	BDL	.	.	.	.
MAY	BDL	BDL	.	.	.	.
JUN	BDL	BDL	.	.	.	.
JUL	BDL	BDL	.	.	.	.
AUG	BDL	.320	.	.	.	.
SEP	BDL	BDL	.	.	.	.
OCT	BDL	.070 <T	.	.	.	.
NOV	BDL	BDL	.	.	.	.
DEC	BDL	BDL	.	.	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM LINDSAY WTP 1990

WATER TREATMENT PLANT

DISTRIBUTION SYSTEM

RAW

TREATED

SITE 3

SITE 2

STANDING

FREE FLOW

STANDING

FREE FLOW

MANGANESE (UG/L)		DET'N LIMIT = 0.05		GUIDELINE = 50 (A3)	
FEB	18.000	13.000	13.000	13.000	
MAR	11.000	6.800	7.500	7.500	11.000
APR	16.000	9.100	8.200	7.400	11.000
MAY	19.000	7.600			13.000
JUN	70.000	13.000	15.000	11.000	20.000
JUL	97.000	15.000	11.000	11.000	20.000
AUG	54.000	18.000	7.100	7.400	13.000
SEP	53.000	23.000	10.000	10.000	
OCT	32.000	4.900	3.400	3.200	12.000
NOV	11.000	2.900	3.200	2.600	8.100
DEC	13.000	3.700	3.700	2.900	7.700

MOLYBDENUM (UG/L)		DET'N LIMIT = 0.05		GUIDELINE = N/A	
FEB	.280 <T	.350 <T	.310 <T	.370 <T	
MAR	.280 <T	.290 <T	.300 <T	.360 <T	.280 <T
APR	.300 <T	.270 <T	.390 <T	.400 <T	.340 <T
MAY	.340 <T	.410 <T			.320 <T
JUN	.280 <T	.370 <T	.360 <T	.340 <T	.160 <T
JUL	.150 <T	.360 <T	.280 <T	.260 <T	.290 <T
AUG	.320 <T	.410 <T	.320 <T	.830	.310 <T
SEP	.360 <T	.450 <T	.420 <T	.440 <T	
OCT	.220 <T	.350 <T	.370 <T	.340 <T	.330 <T
NOV	.320 <T	.330 <T	.340 <T	.340 <T	.370 <T
DEC	.270 <T	.380 <T	.330 <T	.380 <T	.350 <T

NICKEL (UG/L)		DET'N LIMIT = 0.20		GUIDELINE = 350 (D3)	
FEB	BDL	BDL	BDL	BDL	
MAR	BDL	BDL	BDL	BDL	.530 <T
APR	BDL	BDL	BDL	BDL	150.000
MAY	BDL	BDL			170.000
JUN	BDL	BDL	1.300 <T	BDL	70.000
JUL	BDL	BDL	.910 <T	BDL	2.700
AUG	BDL	BDL	BDL	BDL	74.000
SEP	BDL	BDL	BDL	BDL	
OCT	.330 <T	.350 <T	1.400 <T	.370 <T	70.000
NOV	BDL	BDL	.570 <T	BDL	43.000
DEC	.630 <T	BDL	.960 <T	BDL	12.000

LEAD (UG/L)		DET'N LIMIT = 0.05		GUIDELINE = 10. (A1)	
FEB	1.100	.370 <T	.810	.250 <T	
MAR	1.300	.250 <T	.490 <T	.200 <T	3.200
APR	.390 <T	.250 <T	3.200	.290 <T	3.400
MAY	.360 <T	.450 <T			3.800
JUN	.880	.350 <T	3.600	.370 <T	7.200
JUL	1.800	.170 <T	3.200	.700	4.600
AUG	.980	.110 <T	.710	.700	3.600
SEP	.640	.120 <T	.740	.360 <T	
OCT	1.200	.170 <T	1.300	.330 <T	3.700
NOV	.390 <T	.100 <T	6.000	.580	3.100
DEC	.610	.220 <T	3.300	.340 <T	2.200

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM LINDSAY WTP 1990

WATER TREATMENT PLANT

DISTRIBUTION SYSTEM

RAW

TREATED

SITE 3

SITE 2

STANDING

FREE FLOW

STANDING

FREE FLOW

ANTIMONY (UG/L)		DET'N LIMIT = 0.05		GUIDELINE = 146 (D4)	
FEB	.410 <T	.430 <T	.480 <T	.450 <T	.420 <T
MAR	.260 <T	.380 <T	.460 <T	.390 <T	.490 <T
APR	.470 <T	.490 <T	.550	.580	.360 <T
MAY	.340 <T	.410 <T	.	.	.300 <T
JUN	.420 <T	.750	.630	.530	.510
JUL	.320 <T	.340 <T	.460 <T	.440 <T	.410 <T
AUG	.400 <T	.460 <T	.590	.610	.410 <T
SEP	.390 <T	.490 <T	.580	.480 <T	.
OCT	.870	.480 <T	.600	.560	.530
NOV	.440 <T	.390 <T	.610	.430 <T	.450 <T
DEC	.420 <T	.440 <T	.600	.500 <T	.550
SELENIUM (UG/L)		DET'N LIMIT = 1.00		GUIDELINE = 10 (A1)	
FEB	BDL	BDL	BDL	BDL	BDL
MAR	BDL	BDL	BDL	BDL	BDL
APR	BDL	BDL	BDL	BDL	1.200 <T
MAY	BDL	BDL	.	.	1.400 <T
JUN	BDL	BDL	BDL	BDL	BDL
JUL	BDL	BDL	BDL	BDL	1.100 <T
AUG	BDL	BDL	BDL	BDL	BDL
SEP	BDL	BDL	BDL	BDL	.
OCT	BDL	BDL	BDL	BDL	BDL
NOV	BDL	BDL	BDL	BDL	BDL
DEC	BDL	BDL	BDL	BDL	BDL
STRONTIUM (UG/L)		DET'N LIMIT = 0.10		GUIDELINE = N/A	
FEB	170.000	170.000	170.000	170.000	130.000
MAR	120.000	110.000	120.000	120.000	160.000
APR	160.000	150.000	150.000	150.000	210.000
MAY	220.000	210.000	.	.	200.000
JUN	220.000	200.000	210.000	210.000	210.000
JUL	160.000	150.000	160.000	140.000	150.000
AUG	120.000	120.000	120.000	120.000	120.000
SEP	150.000	150.000	150.000	150.000	.
OCT	140.000	140.000	150.000	150.000	140.000
NOV	190.000	180.000	170.000	170.000	180.000
DEC	160.000	160.000	160.000	170.000	150.000
TITANIUM (UG/L)		DET'N LIMIT = 0.50		GUIDELINE = N/A	
FEB	7.900	6.800	7.500	7.300	8.100
MAR	9.200	4.500 <T	7.000	6.600	8.100
APR	16.000	13.000	12.000	12.000	15.000
MAY	17.000	15.000	.	.	15.000
JUN	13.000	9.300	10.000	10.000	12.000
JUL	15.000	11.000	10.000	9.900	11.000
AUG	10.000	7.400	7.500	7.800	7.900
SEP	6.000	2.800 <T	3.000 <T	3.100 <T	.
OCT	6.000	3.700 <T	4.000 <T	4.000 <T	5.800
NOV	5.500	4.800 <T	4.300 <T	4.700 <T	6.400
DEC	5.200	5.100	6.200	5.200	6.400

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM LINDSAY WTP 1990

WATER TREATMENT PLANT

DISTRIBUTION SYSTEM

RAW		TREATED		SITE 3		SITE 2	
				STANDING	FREE FLOW	STANDING	FREE FLOW
URANIUM (UG/L)		DET'N LIMIT = 0.05		GUIDELINE = 100 (A1)			
FEB	.500 <T	.210 <T	.120 <T	.120 <T	.070 <T	BDL	BDL
MAR	.390 <T	BDL	.060 <T	.060 <T	.160 <T	.160 <T	.160 <T
APR	.710	.180 <T	.210 <T	.200 <T	.530	.530	.530
MAY	.860	.480 <T	.	.	.340 <T	.280 <T	.280 <T
JUN	.540	.260 <T	.260 <T	.270 <T	.070 <T	.070 <T	.070 <T
JUL	.190 <T	BDL	BDL	BDL	BDL	BDL	BDL
AUG	.320 <T	BDL	.060 <T	BDL	BDL	BDL	BDL
SEP	.360 <T	BDL	BDL	.100 <T	.	.	.
OCT	.280 <T	BDL	BDL	BDL	BDL	BDL	BDL
NOV	.700	.110 <T	.130 <T	.180 <T	.130 <T	.200 <T	.200 <T
DEC	.450 <T	.300 <T	.270 <T	.290 <T	.230 <T	.270 <T	.270 <T
VANADIUM (UG/L)		DET'N LIMIT = 0.05		GUIDELINE = N/A			
FEB	.560	3.200	2.700	2.500	.	.	.
MAR	.610	2.100	2.100	2.200	.960	1.500	1.500
APR	.620	2.200	2.300	2.300	1.300	1.500	1.500
MAY	.860	2.800	.	.	1.900	1.800	1.800
JUN	1.100	2.700	2.800	2.800	2.200	1.800	1.800
JUL	1.800	1.800	2.000	1.900	1.500	1.600	1.600
AUG	1.300	2.100	1.600	1.700	1.200	1.400	1.400
SEP	.950	1.500	1.600	1.600	.	.	.
OCT	1.100	2.600	2.300	2.300	1.800	1.700	1.700
NOV	.460 <T	1.800	1.600	1.700	.980	1.100	1.100
DEC	.510	2.700	2.200	2.300	1.300	1.600	1.600
ZINC (UG/L)		DET'N LIMIT = 0.20		GUIDELINE = 5000 (A3)			
FEB	8.600	37.000	14.000	5.300	.	.	.
MAR	9.300	25.000	12.000	4.100	230.000	13.000	13.000
APR	4.900	21.000	76.000	4.100	180.000	7.300	7.300
MAY	3.900	33.000	.	.	160.000	11.000	11.000
JUN	9.400	24.000	66.000	5.000	140.000	9.200	9.200
JUL	11.000	2.800	130.000	4.100	220.000	6.800	6.800
AUG	4.900	3.700	14.000	23.000	180.000	12.000	12.000
SEP	2.800	1.900 <T	9.700	4.000	.	.	.
OCT	5.500	5.800	28.000	7.300	220.000	11.000	11.000
NOV	2.800	4.100	160.000	6.100	250.000	8.400	8.400
DEC	2.600	3.200	120.000	6.400	200.000	8.600	8.600

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM LINDSAY WTP 1990

WATER TREATMENT PLANT				DISTRIBUTION SYSTEM			
RAW		TREATED		SITE 3		SITE 2	
		STANDING		FREE FLOW		STANDING	
CHLOROAROMATICS							
HEXACHLOROETHANE (NG/L)		DET'N LIMIT = 1.000		GUIDELINE = 1900 (D4)			
FEB	1QU	1QU	.	1QU	.	.	.
MAR	BDL	BDL	.	BDL	.	.	BDL
APR	BDL	BDL	.	11S	.	.	BDL
MAY	BDL	BDL	.	.	.	.	BDL
JUN	BDL	BDL	.	BDL	.	.	BDL
JUL	BDL	BDL	.	BDL	.	.	BDL
AUG	BDL	BDL	.	BDL	.	.	BDL
SEP	BDL	BDL	.	BDL	.	.	.
OCT	BDL	BDL	.	BDL	.	.	BDL
NOV	BDL	BDL	.	BDL	.	.	BDL
DEC	BDL	1.000 <T	.	.	.	.	BDL
HEXACHLOROCYCLOPENTADIENE (NG/L)		DET'N LIMIT = 5.000		GUIDELINE = 206000 (D4)			
OCT	BDL	120.000	.	170.000	.	.	90.000
NOV	BDL	BDL	.	BDL	.	.	BDL
DEC	BDL	BDL	.	.	.	.	BDL

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM LINDSAY WTP 1990

WATER TREATMENT PLANT

DISTRIBUTION SYSTEM

RAW

TREATED

SITE 3

SITE 2

STANDING

FREE FLOW

STANDING

FREE FLOW

PESTICIDES & PCB

ALPHA BHC (NG/L)

DET'N LIMIT = 1.000

GUIDELINE = 700 (G)

FEB	!QU	!QU	.	!QU	.	1.000 <T
MAR	BDL	2.000 <T	.	1.000 <T	.	1.000 <T
APR	BDL	1.000 <T	.	!IS	.	BDL
MAY	BDL	BDL	.	.	.	BDL
JUN	BDL	BDL	.	BDL	.	BDL
JUL	BDL	BDL	.	BDL	.	BDL
AUG	BDL	BDL	.	BDL	.	BDL
SEP	BDL	BDL	.	BDL	.	.
OCT	1.000 <T	2.000 <T	.	1.000 <T	.	2.000 <T
NOV	1.000 <T	1.000 <T	.	1.000 <T	.	1.000 <T
DEC	BDL	1.000 <T	.	.	.	1.000 <T

ATRAZINE (NG/L)

DET'N LIMIT = 50

GUIDELINE = 60000 (A2)

FEB	BDL	BDL	.	.	.	.
MAR	BDL	BDL	.	.	.	.
APR	BDL	BDL	.	.	.	.
MAY	BDL	BDL	.	.	.	.
JUN	160.000 <T	175.000 <T	.	.	.	.
JUL	100.000 <T	BDL	.	.	.	.
AUG	BDL	BDL	.	.	.	.
SEP	BDL	BDL	.	.	.	.
OCT	70.000 <T	50.000 <T	.	.	.	.
NOV	!IS	BDL	.	.	.	.
DEC	BDL	BDL	.	.	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM LINDSAY WTP 1990

WATER TREATMENT PLANT

DISTRIBUTION SYSTEM

RAW

TREATED

SITE 3

SITE 2

STANDING

FREE FLOW

STANDING

FREE FLOW

PHENOLICS		PHENOLICS		PHENOLICS		PHENOLICS	
PHENOLICS (UG/L)		)		DET'N LIMIT = .20		GUIDELINE = 2 (A4)	
FEB	2.000		2.800	.	.	.	.
MAR	1.600		1.800	.	.	.	.
APR	BDL		.600 <T	.	.	.	.
MAY	.400 <T		.400 <T	.	.	.	.
JUN	BDL		BDL	.	.	.	.
JUL	.400 <T		.400 <T	.	.	.	.
AUG	1.000		1.000 <T	.	.	.	.
SEP	BDL		BDL	.	.	.	.
OCT	BDL		.800 <T	.	.	.	.
NOV	.600 <T		1.000	.	.	.	.
DEC	1.200		1.600	.	.	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM LINDSAY WTP 1990

WATER TREATMENT PLANT

DISTRIBUTION SYSTEM

RAW		TREATED		SITE 3		SITE 2	
		STANDING		FREE FLOW		STANDING	
VOLATILES		DET'N LIMIT = 0.05		GUIDELINE = 5 (A1)			
BENZENE (UG/L)							
FEB	BDL	.050 <T	.	.050 <T	.	.	.
MAR	.050 <T	.100 <T	.	.050 <T	.	.	BDL
APR	BDL	.250 <T	.	.150 <T	.	.	.100 <T
MAY	BDL	.900	.	.	.	.	.050 <T
JUN	!!S	.350 <T	.	.100 <T	.	.	BDL
JUL	BDL	.200 <T	.	.250 <T	.	.	BDL
AUG	BDL	2.250	.	2.150	.	.	1.950
SEP	BDL	BDL	.	BDL	.	.	.
OCT	BDL	.100 <T	.	.050 <T	.	.	BDL
NOV	!!S	.050 <T	.	BDL	.	.	BDL
DEC	BDL	BDL	.	BDL	.	.	BDL
TOLUENE (UG/L)		DET'N LIMIT = 0.05		GUIDELINE = 24 (A3)			
FEB	BDL	BDL	.	BDL	.	.	.
MAR	BDL	BDL	.	BDL	.	.	BDL
APR	BDL	.450 <T	.	.250 <T	.	.	.200 <T
MAY	BDL	.350 <T	.	.	.	.	BDL
JUN	!!S	BDL	.	BDL	.	.	BDL
JUL	BDL	BDL	.	.250 <T	.	.	BDL
AUG	BDL	2.450	.	2.200	.	.	1.750
SEP	BDL	BDL	.	.050 <T	.	.	.
OCT	BDL	.250 <T	.	.200 <T	.	.	.150 <T
NOV	!!S	BDL	.	BDL	.	.	BDL
DEC	BDL	BDL	.	BDL	.	.	BDL
ETHYLBENZENE (UG/L)		DET'N LIMIT = 0.05		GUIDELINE = 2.4 (A3)			
FEB	BDL	.150 <T	.	.050 <T	.	.	.
MAR	.050 <T	.050 <T	.	.100 <T	.	.	.100 <T
APR	BDL	.200 <T	.	BDL	.	.	.100 <T
MAY	BDL	BDL	.	.	.	.	BDL
JUN	!!S	.150 <T	.	BDL	.	.	BDL
JUL	BDL	BDL	.	.050 <T	.	.	BDL
AUG	BDL	.250 <T	.	.300 <T	.	.	.100 <T
SEP	BDL	BDL	.	BDL	.	.	.
OCT	BDL	.100 <T	.	.050 <T	.	.	.050 <T
NOV	!!S	.050 <T	.	.050 <T	.	.	BDL
DEC	BDL	.100 <T	.	.050 <T	.	.	.050 <T
M-XYLENE (UG/L)		DET'N LIMIT = 0.10		GUIDELINE = 300 (A3*)			
FEB	BDL	BDL	.	BDL	.	.	.
MAR	BDL	BDL	.	BDL	.	.	BDL
APR	BDL	.500 <T	.	BDL	.	.	.100 <T
MAY	BDL	BDL	.	.	.	.	BDL
JUN	!!S	1.000 <T	.	BDL	.	.	BDL
JUL	BDL	BDL	.	BDL	.	.	BDL
AUG	BDL	.400 <T	.	.500 <T	.	.	BDL
SEP	BDL	BDL	.	BDL	.	.	.
OCT	BDL	.200 <T	.	.200 <T	.	.	BDL
NOV	!!S	BDL	.	BDL	.	.	BDL
DEC	BDL	BDL	.	BDL	.	.	BDL

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM LINDSAY WTP 1990

WATER TREATMENT PLANT

DISTRIBUTION SYSTEM

RAW		TREATED	SITE 3		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
O-XYLENE (UG/L)		DET'N LIMIT = 0.05		GUIDELINE = 300 (A3*)		
FEB	BDL	BDL	.	BDL	.	BDL
MAR	BDL	BDL	.	BDL	.	.100 <T
APR	BDL	.250 <T	.	BDL	.	BDL
MAY	BDL	BDL	.	.	.	BDL
JUN	!!S	.400 <T	.	BDL	.	BDL
JUL	BDL	BDL	.	.050 <T	.	BDL
AUG	BDL	1.300	.	1.100	.	.250 <T
SEP	BDL	BDL	.	BDL	.	.
OCT	BDL	.100 <T	.	.100 <T	.	BDL
NOV	!!S	.050 <T	.	BDL	.	BDL
DEC	BDL	BDL	.	BDL	.	BDL
STYRENE (UG/L)		DET'N LIMIT = 0.05		GUIDELINE = 100 (D1)		
FEB	.050 <T	.100 <T	.	.100 <T	.	.
MAR	.100 <T	BDL	.	BDL	.	.100 <T
APR	BDL	.150 <T	.	BDL	.	.100 <T
MAY	BDL	BDL	.	.	.	BDL
JUN	!!S	.300 <T	.	BDL	.	BDL
JUL	BDL	.050 <T	.	.100 <T	.	BDL
AUG	BDL	BDL	.	.150 <T	.	BDL
SEP	BDL	.050 <T	.	.050 <T	.	.
OCT	BDL	BDL	.	BDL	.	BDL
NOV	!!S	BDL	.	.050 <T	.	.050 <T
DEC	BDL	.050 <T	.	.100 <T	.	.100 <T
T1,2DICHOROETHYLENE (UG/L)		DET'N LIMIT = 0.10		GUIDELINE = 70 (D1)		
FEB	BDL	BDL	.	BDL	.	BDL
MAR	BDL	BDL	.	BDL	.	BDL
APR	BDL	BDL	.	BDL	.	BDL
MAY	BDL	BDL	.	.	.	BDL
JUN	!!S	BDL	.	BDL	.	BDL
JUL	BDL	BDL	.	BDL	.	.100 <T
AUG	BDL	.200 <T	.	.300 <T	.	.400 <T
SEP	BDL	BDL	.	BDL	.	.
OCT	BDL	BDL	.	BDL	.	BDL
NOV	!!S	BDL	.	BDL	.	BDL
DEC	BDL	BDL	.	BDL	.	BDL
CHLOROFORM (UG/L)		DET'N LIMIT = 0.10		GUIDELINE = 350 (A1+)		
FEB	BDL	79.700	.	57.000	.	.
MAR	BDL	15.600	.	21.000	.	15.900
APR	BDL	59.100	.	56.800	.	59.400
MAY	BDL	74.600	.	.	.	56.300
JUN	!!S	115.300	.	118.500	.	130.800
JUL	BDL	120.900	.	100.100	.	107.900
AUG	.200 <T	71.300	.	52.300	.	59.200
SEP	BDL	62.800	.	58.600	.	.
OCT	BDL	71.200	.	61.000	.	47.600
NOV	!!S	104.300	.	91.500	.	75.800
DEC	BDL	61.300	.	68.400	.	55.300

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM LINDSAY WTP 1990

WATER TREATMENT PLANT

DISTRIBUTION SYSTEM

RAW

TREATED

SITE 3

SITE 2

STANDING

FREE FLOW

STANDING

FREE FLOW

111, TRICHLOROETHANE (UG/L)

DET'N LIMIT = 0.02

GUIDELINE = 200 (D1)

FEB	BDL	BDL	.	BDL	.	.
MAR	BDL	BDL	.	BDL	.	BDL
APR	BDL	BDL	.	BDL	.	BDL
MAY	BDL	BDL	.	.	.	BDL
JUN	!IS	.140 <T	.	.140 <T	.	.160 <T
JUL	BDL	BDL	.	BDL	.	BDL
AUG	BDL	BDL	.	BDL	.	BDL
SEP	BDL	BDL	.	BDL	.	.
OCT	BDL	BDL	.	BDL	.	BDL
NOV	!IS	BDL	.	BDL	.	BDL
DEC	BDL	BDL	.	BDL	.	BDL

DICHLOROBROMOMETHANE (UG/L)

DET'N LIMIT = 0.05

GUIDELINE = 350 (A1+)

FEB	BDL	6.600	.	5.450	.	.
MAR	BDL	1.800	.	2.350	.	1.850
APR	BDL	4.250	.	4.100	.	4.250
MAY	BDL	5.000	.	.	.	3.700
JUN	!IS	9.150	.	8.250	.	10.000
JUL	BDL	9.950	.	8.900	.	9.300
AUG	BDL	8.850	.	7.500	.	7.700
SEP	BDL	9.200	.	8.900	.	.
OCT	BDL	6.600	.	6.000	.	4.800
NOV	!IS	8.300	.	7.900	.	6.900
DEC	BDL	7.350	.	7.500	.	6.500

CHLORODIBROMOMETHANE (UG/L)

DET'N LIMIT = 0.10

GUIDELINE = 350 (A1+)

FEB	BDL	.300 <T	.	.300 <T	.	.
MAR	BDL	.100 <T	.	.200 <T	.	.100 <T
APR	BDL	.200 <T	.	.200 <T	.	.200 <T
MAY	BDL	.200 <T	.	.	.	.200 <T
JUN	!IS	.400 <T	.	.400 <T	.	.400 <T
JUL	BDL	.500 <T	.	.400 <T	.	.400 <T
AUG	BDL	.600 <T	.	.500 <T	.	.500 <T
SEP	BDL	.300 <T	.	.300 <T	.	.
OCT	BDL	.300 <T	.	.300 <T	.	.200 <T
NOV	!IS	.300 <T	.	.300 <T	.	.300 <T
DEC	BDL	.500 <T	.	.300 <T	.	.300 <T

T-CHLOROETHYLENE (UG/L)

DET'N LIMIT = 0.05

GUIDELINE = 5 (D1)

FEB	BDL	BDL	.	BDL	.	.
MAR	BDL	BDL	.	BDL	.	BDL
APR	BDL	.050 <T	.	.050 <T	.	.050 <T
MAY	BDL	.100 <T	.	.	.	.150 <T
JUN	!IS	.150 <T	.	.150 <T	.	.150 <T
JUL	BDL	.350 <T	.	.350 <T	.	.350 <T
AUG	BDL	.150 <T	.	.200 <T	.	.250 <T
SEP	BDL	.100 <T	.	.100 <T	.	.
OCT	BDL	BDL	.	BDL	.	BDL
NOV	!IS	BDL	.	BDL	.	BDL
DEC	BDL	BDL	.	BDL	.	BDL

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM LINDSAY WTP 1990

WATER TREATMENT PLANT

DISTRIBUTION SYSTEM

RAW

TREATED

SITE 3

SITE 2

STANDING

FREE FLOW

STANDING

FREE FLOW

TOTL TRIHALOMETHANES (UG/L)

DET'N LIMIT = 0.50

GUIDELINE = 350 (A1)

FEB	BDL	86.600	.	62.750	.	.
MAR	BDL	17.500	.	23.550	.	17.850
APR	BDL	63.550	.	61.100	.	63.800
MAY	BDL	80.600	.	.	.	60.000
JUN	!IS	124.850	.	127.150	.	141.200
JUL	BDL	131.350	.	109.350	.	117.600
AUG	BDL	80.800	.	60.300	.	67.400
SEP	BDL	72.250	.	67.850	.	.
OCT	BDL	78.100	.	67.250	.	52.600
NOV	!IS	112.900	.	99.700	.	82.900
DEC	BDL	69.200	.	76.150	.	62.050

TRACE LEVELS OF TOLUENE ARE LABORATORY ARTIFACTS DERIVED FROM THE ANALYTICAL METHODOLOGY.

TRACE LEVELS OF STYRENE ARE CONSIDERED TO BE LABORATORY ARTIFACTS RESULTING FROM THE LABORATORY SHIPPING CONTAINERS.

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
BACTERIOLOGICAL			
FECAL COLIFORM MEMBRANE FILTRATION	CT/100ML	0	0 (A1)
STANDARD PLATE COUNT MEMBRANE FILT.	CT/ML	0	500/ML (A3)
TOTAL COLIFORM BACKGROUND MF	CT/100ML	0	N/A
TOTAL COLIFORM MEMBRANE FILTRATION	CT/100ML	0	5/100ML (A1)
CHEMISTRY (FLD)			
FIELD COMBINED CHLORINE RESIDUAL	MG/L	0	N/A
FIELD TOTAL CHLORINE RESIDUAL	MG/L	0	N/A
FIELD FREE CHLORINE RESIDUAL	MG/L	0	N/A
FIELD PH	DMNSLESS	N/A	6.5-8.5 (A3)
FIELD TEMPERATURE	DEG.C	N/A	15.0 (A3)
FIELD TURBIDITY	FTU	N/A	1.0 (A1)
CHEMISTRY (LAB)			
ALKALINITY	MG/L	0.2	30-500 (A3)
AMMONIUM TOTAL	MG/L	0.002	0.05 (F2)
CALCIUM	MG/L	0.2	100 (F2)
CHLORIDE	MG/L	0.2	250 (A3)
COLOUR	TCU	0.5	5.0 (A3)
CONDUCTIVITY	UMHO/CM	1.0	400 (F2)
CYANIDE	MG/L	0.001	0.2 (A1)
DISSOLVED ORGANIC CARBON	MG/L	0.1	5.0 (A3)
FLUORIDE	MG/L	0.01	2.4 (A1)
HARDNESS	MG/L	0.5	80-100 (A4)
LANGELIERS INDEX	DMNSLESS	N/A	N/A
MAGNESIUM	MG/L	0.1	30.0 (F2)
NITRITE	MG/L	0.001	1.0 (A1)
NITROGEN TOTAL KJELDAHL	MG/L	0.02	N/A
PH	DMNSLESS	N/A	6.5-8.5 (A4)
PHOSPHORUS FIL REACT	MG/L	0.0005	N/A
PHOSPHORUS TOTAL	MG/L	0.002	0.4 (F2)
SODIUM	MG/L	0.2	200 (A4)
SULPHATE	MG/L	0.2	500 (A3)
TOTAL NITRATES	MG/L	0.005	10.0 (A1)
TURBIDITY	FTU	0.05	1.0 (A1)
CHLOROAROMATICS			
123 TRICHLOROBENZENE	NG/L	5.0	N/A
1234 TETRACHLOROBENZENE	NG/L	1.0	N/A
1235 TETRACHLOROBENZENE	NG/L	1.0	N/A
124 TRICHLOROBENZENE	NG/L	5.0	10000 (I)
1245-TETRACHLOROBENZENE	NG/L	1.0	38000 (D4)
135 TRICHLOROBENZENE	NG/L	5.0	N/A
236 TRICHLOROTOLUENE	NG/L	5.0	N/A
245 TRICHLOROTOLUENE	NG/L	5.0	N/A
26A TRICHLOROTOLUENE	NG/L	5.0	N/A
HEXACHLOROBENZENE	NG/L	1.0	10 (C1)
HEXACHLOROBUTADIENE	NG/L	1.0	450 (D4)
HEXACHLOROCYCLOPENTADIENE	NG/L	5.0	206000 (D4)
HEXACHLOROETHANE	NG/L	1.0	1900 (D4)
OCTACHLOROSTYRENE	NG/L	1.0	N/A
PENTACHLOROBENZENE	NG/L	1.0	74000 (D4)
CHLOROPHENOLS			
234 TRICHLOROPHENOL	NG/L	100.0	N/A
2345 TETRACHLOROPHENOL	NG/L	20.0	N/A
2356 TETRACHLOROPHENOL	NG/L	10.0	N/A

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
245 TRICHLOROPHENOL	NG/L	100.0	2600000 (D4)
246 TRICHLOROPHENOL	NG/L	20.0	5000 (A1)
PENTACHLOROPHENOL	NG/L	10.0	60000 (A1)
METALS			
ALUMINUM	UG/L	0.10	100 (A4)
ANTIMONY	UG/L	0.05	146 (D4)
ARSENIC	UG/L	0.10	25 (A1)
BARIUM	UG/L	0.05	1000 (A2)
BERYLLIUM	UG/L	0.05	6800 (D4)
BORON	UG/L	2.00	5000 (A1)
CADMIUM	UG/L	0.05	5 (A1)
CHROMIUM	UG/L	0.50	50 (A1)
COBALT	UG/L	0.02	N/A
COPPER	UG/L	0.50	1000 (A3)
IRON	UG/L	6.00	300 (A3)
LEAD	UG/L	0.05	10 (A1)
MANGANESE	UG/L	0.05	50 (A3)
MERCURY	UG/L	0.02	1 (A1)
MOLYBDENUM	UG/L	0.05	N/A
NICKEL	UG/L	0.20	350 (D3)
SELENIUM	UG/L	1.00	10 (A1)
SILVER	UG/L	0.05	50 (A1)
STRONTIUM	UG/L	0.10	N/A
THALLIUM	UG/L	0.05	13 (D4)
TITANIUM	UG/L	0.50	N/A
URANIUM	UG/L	0.05	100 (A1)
VANADIUM	UG/L	0.05	N/A
ZINC	UG/L	0.20	5000 (A3)
PAH			
ANTHRACENE	NG/L	1.0	N/A
BENZO(A) ANTHRACENE	NG/L	20.0	N/A
BENZO(A) PYRENE	NG/L	5.0	10.0 (A1)
BENZO(B) CHRYSENE	NG/L	2.0	N/A
BENZO(B) FLUORANTHENE	NG/L	10.0	N/A
BENZO(E) PYRENE	NG/L	50.0	N/A
BENZO(G,H,I) PERYLENE	NG/L	20.0	N/A
BENZO(K) FLUORANTHENE	NG/L	1.0	N/A
CHRYSENE	NG/L	50.0	N/A
CORONENE	NG/L	10.0	N/A
DIBENZO(A,H) ANTHRACENE	NG/L	10.0	N/A
DIMETHYL BENZO(A) ANTHRACENE	NG/L	5.0	N/A
FLUORANTHENE	NG/L	20.0	42000.0 (D4)
INDENO(1,2,3-C,D) PYRENE	NG/L	20.0	N/A
PERYLENE	NG/L	10.0	N/A
PHENANTHRENE	NG/L	10.0	N/A
PYRENE	NG/L	20.0	N/A
PESTICIDES & PCB			
ALACHLOR (LASSO)	NG/L	500.0	5000 (A2)
ALDRIN	NG/L	1.0	700 (A1)
ALPHA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	700 (G)
ALPHA CHLORDANE	NG/L	2.0	7000 (A1)
AMETRINE	NG/L	50.0	300000 (D3)
ATRATONE	NG/L	50.0	N/A
ATRAZINE	NG/L	50.0	60000 (A2)
DES ETHYL ATRAZINE	NG/L	200.0	60000 (A2)
BETA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	300 (G)
CYANAZINE (BLADDEX)	NG/L	100.0	10000 (A2)
O,P-DDD	NG/L	5.0	10 (I)
DIELDRIN	NG/L	2.0	700 (A1)
ENDOSULFAN 1 (THIODAN I)	NG/L	2.0	74000 (D4)
ENDOSULFAN 2 (THIODAN II)	NG/L	5.0	74000 (D4)

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
ENDOSULFAM SULPHATE (THIODAN SULPHATE)	NG/L	5.0	N/A
ENDRIN	NG/L	5.0	1600 (D3)
GAMMA CHLORDANE	NG/L	2.0	7000 (A1)
HEPTACHLOR	NG/L	1.0	3000 (A1)
HEPTACHLOR EPOXIDE	NG/L	1.0	3000 (A1)
LINDANE (GAMMA BHC)	NG/L	1.0	4000 (A1)
METHOXYCHLOR	NG/L	5.0	900000 (A1)
METOLACHLOR	NG/L	500.0	50000 (A2)
METRIBUZIN (SENCOR)	NG/L	100.0	80000 (A1)
MIREX	NG/L	5.0	N/A
P,P-DDD	NG/L	5.0	N/A
O,P-DDT	NG/L	5.0	30000 (A1)
OXYCHLORDANE	NG/L	2.0	N/A
PCB	NG/L	20.0	3000 (A2)
PPDDE	NG/L	1.0	30000 (A1)
PPDDT	NG/L	5.0	30000 (A1)
PROMETONE	NG/L	50.0	52500 (D3)
PROMETRYNE	NG/L	50.0	1000 (A2)
PROPAZINE	NG/L	50.0	700000 (D3)
SIMAZINE	NG/L	50.0	10000 (A2)
D-ETHYL SIMAZINE	NG/L	200.0	10000 (A2)
TOXAPHENE	NG/L	500.0	5000 (A1)
PHENOLICS			
PHENOLICS (UNFILTERED REACTIVE)	UG/L	0.2	2 (A4)
SPECIFIC PESTICIDES			
2,4 D PROPIONIC ACID	NG/L	100.	N/A
2,4,5-TRICHLOROPHENOXY ACETIC ACID	NG/L	50.	280000 (A1)
2,4-DICHLOROBUTYRIC ACID (2,4-D)	NG/L	100.	100000 (A1)
24-DICHLOROPHENOXYBUTYRIC ACID (24-DB)	NG/L	200.	18000 (B3)
BUTYLATE (SUTAN)	NG/L	2000.	245000 (D3)
CARBARYL (SEVIN)	NG/L	200.	90000 (A1)
CARBOFURAN	NG/L	2000.	90000 (A1)
CHLORPYRIFOS (DURBAN)	NG/L	20.	N/A
CICP (CHLORPROPHAM)	NG/L	2000.	350000 (G)
DIALATE	NG/L	2000.	N/A
DIAZINON	NG/L	20.	20000 (A1)
DICAMBA	NG/L	50.	120000 (A1)
DICHLOROVOS	NG/L	20.	N/A
EPTAM	NG/L	2000.	N/A
ETHION	NG/L	20.	35000 (G)
IPC	NG/L	2000.	N/A
MALATHION	NG/L	20.	190000 (A1)
METHYL PARATHION	NG/L	50.	7000 (B3)
METHYLTRITHION	NG/L	20.	N/A
MEVINPHOS	NG/L	20.	N/A
PARATHION	NG/L	20.	50000 (A1)
PHORATE (THIMET)	NG/L	20.	2000 (A2)
PROPOXUR (BAYGON)	NG/L	2000.	140000 (D3)
RELDAN	NG/L	20.	N/A
RONNEL	NG/L	20.	N/A
SILVEX (2,4,5-TP)	NG/L	20.	10000 (A1)
VOLATILES			
1,1 DICHLOROETHANE	UG/L	0.10	N/A
1,1 DICHLOROETHYLENE	UG/L	0.10	7 (D1)
1,2 DICHLOROBENZENE	UG/L	0.05	200 (A1)
1,2 DICHLOROETHANE	UG/L	0.05	5 (A1)

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
1,2 DICHLOROPROPANE	UG/L	0.05	5 (D1)
1,3 DICHLOROBENZENE	UG/L	0.10	3750 (D3)
1,4 DICHLOROBENZENE	UG/L	0.10	5 (A1)
111, TRICHLOROETHANE	UG/L	0.02	200 (D1)
112 TRICHLOROETHANE	UG/L	0.05	0.6 (D4)
1122 TETRACHLOROETHANE	UG/L	0.05	0.17(D4)
BENZENE	UG/L	0.05	5 (A1)
BROMOFORM	UG/L	0.20	350 (A1+)
CARBON TETRACHLORIDE	UG/L	0.20	5 (A1)
CHLOROBENZENE	UG/L	0.10	1510 (D3)
CHLORODIBROMOMETHANE	UG/L	0.10	350 (A1+)
CHLOROFORM	UG/L	0.10	350 (A1+)
DICHLOROBROMOMETHANE	UG/L	0.05	350 (A1+)
ETHYLENE DIBROMIDE	UG/L	0.05	50 (D1)
ETHYLBENZENE	UG/L	0.05	2.4 (A3)
M-XYLENE	UG/L	0.10	300 (A3*)
METHYLENE CHLORIDE	UG/L	0.50	50 (A1)
O-XYLENE	UG/L	0.05	300 (A3*)
P-XYLENE	UG/L	0.10	300 (A3*)
STYRENE	UG/L	0.05	100 (D1)
TETRACHLOROETHYLENE	UG/L	0.05	5 (D1)
TRANS 1,2 DICHLOROETHYLENE	UG/L	0.10	70 (D1)
TOLUENE	UG/L	0.05	24 (A3)
TOTAL TRIHALOMETHANES	UG/L	0.50	350 (A1)
TRICHLOROETHYLENE	UG/L	0.10	50 (A1)

Appendix A

DRINKING WATER SURVEILLANCE PROGRAM PROGRAM DESCRIPTION

The Drinking Water Surveillance Program (DWSP) for Ontario monitors drinking water quality at municipal water supply systems. The DWSP Database Management System provides a computerized drinking water quality information system for the supplies monitored. The objectives of the program are to provide:

- immediate, reliable, current information on drinking water quality;
- a flagging mechanism for guideline exceedance;
- a definition of contaminant levels and trends;
- a comprehensive background for remedial action;
- a framework for assessment of new contaminants; and
- an indication of treatment efficiency of plant processes.

PROGRAM

The DWSP officially began in April 1986 and is designed to eventually include all municipal water supplies in Ontario. In 1990, 76 systems were being monitored. Water supply locations have been prioritized for surveillance based primarily on criteria such as population density, probability of contamination and geographical location.

An ongoing assessment of future monitoring requirements at each location will be made. Monitoring will continue at the initial locations at an appropriate level and further locations will be phased into the program as resources permit.

A major goal of the program is to collect valid water quality data in context with plant operational characteristics at the time of sampling. As soon as sufficient data have been accumulated and analyzed, both the frequency of sampling and the range of parameters may be adjusted accordingly.

Assessments are carried out at all locations prior to initial sampling, in order to acquire complete plant process and distribution system details and to designate (and retrofit if necessary) all sampling systems and locations. This ensures that the sampled water is a reflection of the water itself.

Samples are taken of raw (ambient water) and treated water at the treatment plant and of consumer's tap water in the distribution system. In order to determine possible effects of distribution on water quality, both standing and free flow water in old and new sections of the distribution system are sampled. Sampling is carried out by operational personnel who have been trained in applicable procedures.

Comprehensive standardized procedures and field test kits are supplied to sampling personnel. This ensures that samples are taken and handled according to standard protocols and that field testing will supply reliable data. All field and laboratory analyses are carried out using "approved documented procedures". Most laboratory analyses are carried out by the Ministry of Environment (MOE), Laboratory Services Branch. Radionuclides are analyzed by the Ministry of Labour.

DATA REPORTING MECHANISM

When the analytical results are transferred from the MOE laboratory into the DWSP system, printouts of the completed analyses are sent to the MOE District Officer, the appropriate operational staff and are also retained by the DWSP unit.

PROGRAM INPUTS AND OUTPUTS

There are four major inputs and four major outputs in the program.

Program Input - Plant and Distribution System Description

The system description includes plant specific non-analytical information acquired through a questionnaire and an initial plant visit. During the initial assessment of the plant and distribution system, questionnaire content is verified and missing information added. It is intended that all data be kept current with scheduled annual updates.

The Plant and Distribution System Description consists of the following seven components:

1. PROCESS COMPONENT INVENTORY

All physical and chemical processes to which the water is subjected, from the intake pipe to the consumers' tap (where possible), are documented. These include: process type, general description of physical structures, material types, sizes, and retention time for each process within the plant. The processes may be as simple as transmission or as complex as carbon adsorption.

2. TREATMENT CHEMICALS

Chemicals used in the treatment processes, their function, application point, supplier and brand-name are recorded. Chemical dosages applied on the day of sampling are recorded in DWSP.

3. PROCESS CONTROL MEASUREMENTS

Documentation of in-plant monitoring of process parameters (eg. turbidity, chlorine residuals, pH, aluminum residuals) including methods used, monitoring locations and frequency is contained in this section. Except for the recorded Field Data, in-plant monitoring results are not retained in DWSP but are retained by the water treatment plant personnel.

4. DESIGN FLOW AND RETENTION TIME

Hydraulic capacity, designed and actual, is noted here. Retention time (the time that a block of water is retained in the plant) is also noted. Maximum, minimum and average flow, as well as a record of the flow rate on the day of sampling, are recorded in DWSP.

5. DISTRIBUTION SYSTEM DESCRIPTION

This area includes the storage and transmission characteristics of the distribution system after the water leaves the plant.

6. SAMPLING SYSTEM

Each plant is assessed for its adequacy in terms of the sampling of bacteriological, organic and inorganic parameters. Prime considerations in the assessment and design of the sampling system are:

- i/ the sample is an accurate representation of the actual water condition, eg. raw water has had no chemical treatment;
- ii/ the water being sampled is not being modified by the sampling system;
- iii/ the sample tap must be in a clean area of the plant, preferably a lab area; and
- iv/ the sample lines must be organically inert (no plastic, ideally stainless steel).

It is imperative that the sampled water be a reflection not of the sampling system but of the water itself.

The sampling system documentation includes: origin of the water; date sampling was initiated; size, length and material type (intake,

discharge and tap); pump characteristics (model, type, capacity); and flow rate.

7. PERSONNEL

This section contains the names, addresses and phone numbers of current plant management and operational staff, distribution system management and operational staff, Medical Officer of Health and appropriate MOE personnel associated with the plant.

Program Input - Field Data

The second major input to DWSP is field data. Field data is collected at the plant and from the distribution system sites on the day of sampling. Field data consists of general operating conditions and the results of testing for field parameters. General operating conditions include chemicals used, dosages, flow and retention time on the day of sampling, as well as, monthly maximum, minimum and average flows. Field parameters include turbidity, chlorine residuals (free, combined and total), temperature and pH. These parameters are analyzed according to standardized DWSP protocols to allow for interplant comparison.

Program Input - Laboratory Analytical Data

The third major input to DWSP is Laboratory Analytical Data. Samples gathered from the raw, treated and distribution sampling sites are analyzed for the presence of approximately 180 parameters at a frequency of two to twelve times per year. Sixty-five percent of the parameters are organic. Parameters measured may have health or aesthetic implications when present in drinking water. Many of the parameters may be used in the treatment process or may be treatment by-products. Due to the nature of certain analytical instruments, parameters may be measured in a "scan" producing some results for parameters that are not on the DWSP priority list, but which may be of interest. The majority of parameters are measured on a routine basis. Those that are technically more difficult and/or costly to analyze, however, are done less frequently. These include Specific Pesticides and Chlorophenols.

Although the parameter list is extensive, additional parameters with the potential to cause health or aesthetic related problems may be added provided reliable analytical and sampling methods exist.

All laboratory generated data is derived from standardized, documented analytical protocols. The analytical method is an integral part of the data and as methods change, notation will be made and comparison data documented.

Program Input - Parameter Reference Information

The fourth major input to DWSP is Parameter Reference Information. This is a catalogue of information for each substance analyzed on DWSP. It includes parameter name and aliases, physical and chemical properties, basic toxicology, world-wide health limits, treatment methods and uses. The Parameter Reference Information is computerized and can be accessed through the Query function of the DWSP database. An example is shown in figure 1.

Program output - Query

All DWSP information is easily accessed through the Query function, therefore, anything from addresses of plant personnel to complete water quality information for a plant's water supply is instantly available. The DWSP computer system makes relatively complex inquiries manageable. A personal password allowing access into the DWSP query mode in all MOE offices is being developed by the DWSP group.

Program Output - Action Alerts

Drinking Water quality in Ontario is evaluated against provincial objectives as outlined in the Ontario Drinking Water Objectives publication. Should the reported level of a substance in treated water exceed the Ontario Drinking Water Objective, an "Action Alert" requiring resampling and confirmation is issued. This assures that operational staff, health authorities and the public are notified as soon as possible of the confirmation of an exceedance and remedial action taken. This report supplies a history of the occurrence of past exceedances at the plant plus a historical summary on the parameter of concern.

In the absence of Ontario Drinking Water Objectives, guidelines/limits from other agencies are used. The Parameter Listing System, published by MOE (ISBN 0-7729-4461-X), catalogues and keeps current guidelines for 650 parameters from agencies throughout the world. If these guidelines are exceeded, the results are flagged and evaluated by DWSP personnel. An "Action Alert" will be issued if warranted.

Program Output - Report Generation

Custom reports can be generated from DWSP to meet MOE Regional needs and to respond to public requests.

Program Output - Annual Reports

It is the practice of DWSP to produce an annual report containing analytical data along with companion plant information.

FIG.1

MOE - DRINKING WATER ASSESSMENT PROGRAM (DWSP)

PARAMETER REFERENCE INFORMATION

BENZENE (B2001P)

VOLATILES

CLASS: HEALTH METHOD: POCODO UNIT: µg/L

SOURCE	FROM	TO	METHOD	GUIDELINE	UNIT	NOTE
CAL C	85/01			0.700	µg/L	AL
CDWG C	87/01			5.000	µg/L	MAC
EPA C	87/07			5.000	µg/L	MCL
EPAA C	80/11			6.600	µg/L	AMBIENT **
FERC C	84/05			1.000	µg/L	MCL
WHO C	84/01			10.000	µg/L	GV

DESCRIPTION: NAME: BENZENE

CAS#: 71-43-2

MOLECULAR FORMULAE: C₆H₆

DETECTION LIMIT: (FOR METHOD POCODO) 0.05 µg/L

SYNONYMS: BENZOL; BENZOLE; COAL NAPHTHA; CARBON OIL (27).
CYCLOHEXATRIENE (41).

CHARACTERISTICS: COLOURLESS TO LIGHT-YELLOW, MOBILE, NON-POLAR LIQUID, OF HIGHLY REFRACTIVE NATURE, AROMATIC ODOUR; VAPOURS BURN WITH SMOKING FLAME (30).

PROPERTIES: SOLUBILITY IN WATER: 1780-1800 mg/L AT 25C (41).
THRESHOLD ODOUR: 0.5 - 10 PPM IN WATER
THRESHOLD TASTE: 0.5 mg/L IN WATER (39).

ENVIRONMENTAL FATE: MAY BIOACCUMULATE IN LIVING ORGANISMS AND APPEARS TO ACCUMULATE IN ANIMAL TISSUES THAT EXHIBIT A HIGH LIPID CONTENT OR REPRESENT MAJOR METABOLIC SITES, SUCH AS LIVER OR BRAIN; SMALL QUANTITIES EVAPORATE FROM SOILS OR ARE DEGRADED RATHER QUICKLY (80).

SOURCES: COMMERCIAL: PETROLEUM REFINING; SOLVENT RECOVERY; COAL TAR DISTILLATION (39); FOOD PROCESSING AND TANNING INDUSTRIES; COMBUSTION OF CAR EXHAUST.
ENVIRONMENTAL: POSSIBLE SOURCE IS RUNOFF.

USES: DETERGENTS; NYLON; INTERMEDIATE IN PRODUCTION OF OTHER COMPOUNDS, SUCH AS PESTICIDES; SOLVENT FOR EXTRACTION AND RECTIFICATION IN RUBBER INDUSTRY; DEGREASING AND CLEANSING AGENT; GASOLINE.

TOXICITY: RATING: 4 (VERY TOXIC).
ACUTE: IRRITATING TO MUCOUS MEMBRANES; SYMPTOMS INCLUDE RESTLESSNESS, CONVULSIONS, EXCITEMENT, DEPRESSION; DEATH MAY FOLLOW RESPIRATORY FAILURE.
CHRONIC: MAY CAUSE ANAEMIA AND LEUKAEMIA (45);
MUTAGENIC.
MODE OF ACTION: CHROMOABERRATION IN LYMPHOCYTE CULTURES.

CARCINOGENICITY: A KNOWN HUMAN CARCINOGEN.

REMOVAL: THE FOLLOWING PROCESSES HAVE BEEN SUCCESSFUL IN REMOVING BENZENE FROM WASTEWATER: GAC ADSORPTION, PRECIPITATION WITH ALUM AND SUBSEQUENT REMOVAL VIA SEDIMENTATION, COAGULATION AND FLOCCULATION, SOLVENT EXTRACTION, OXIDATION

ADDITIONAL PROPERTIES:

MOLECULAR WEIGHT: 78.12
MELTING POINT: 5.5°C (27).
BOILING POINT: 80.1°C (27).
SPECIFIC GRAVITY: 0.8790 AT 20°C (27).
VAPOUR PRESSURE: 100 MM AT 26.1°C (27).
HENRY'S LAW CONSTANT: 0.00555 ATM-M³/MOLE (41).
LOG OCT./WATER PARTITION COEFFICIENT: 1.95 TO 2.13 (39).
CARBON ADSORPTION: K=1.0; 1/N=1.6; R=0.97; PH=5.3 (41)
SEDIMENT/WATER PARTITION COEFFICIENT: NO DATA
NOTES: EPA PRIORITY POLLUTANT.

Appendix B

DWSP SAMPLING GUIDELINE

i) Raw and Treated at Plant

General Chemistry

- 500 mL plastic bottle (PET 500)
- rinse bottle and cap with sample water three times
- fill to 2 cm from top

Bacteriological

- 220 mL plastic bottle with white seal on cap
- do not rinse bottle, preservative has been added
- avoid touching bottle neck or inside of cap
- fill to top of red label as marked

Metals

- 500 mL plastic bottle (PET 500)
- rinse bottle and cap three times
- fill to 2 cm from top
- add 10 drops nitric acid (HNO_3)
(Caution: HNO_3 is corrosive)

Volatiles (duplicates) (OPOPUP)

- 45 mL glass vial with septum
(teflon side must be in contact with sample)
- do not rinse bottle
- fill bottle completely without bubbles

Organics (OWOC), (OWTRI), (OAPAHX)

- 1 L amber glass bottle per scan
- do not rinse bottle
- fill to 2 cm from top
- when 'special pesticides' are requested three extra bottles must be filled

Cyanide	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops sodium hydroxide (NaOH) (Caution: NaOH is corrosive)
Mercury	-250 mL glass bottle -rinse bottle and cap three times -fill to top of label -add 20 drops each nitric acid (HNO_3) - and potassium dichromate ($\text{K}_2\text{Cr}_2\text{O}_7$) (Caution: HNO_3 & $\text{K}_2\text{Cr}_2\text{O}_7$ are corrosive)
Phenols	-250 mL glass bottle -do <u>not</u> rinse bottle, preservative - has been added -fill to top of label
Radionuclides (as scheduled)	-4 L plastic jug -do <u>not</u> rinse, carrier added -fill to 5 cm from top
Organic Characterization (GC/MS - once per year)	-1 L amber glass bottle; instructions - as per organic -250 mL glass bottle -do <u>not</u> rinse bottle -fill completely without bubbles

Steps:

1. Let sampling water tap run for an adequate time to clear the sample line.
2. Record time of day on submission sheet.
3. Record temperature on submission sheet.
4. Fill up all bottles as per instructions.
5. Record chlorine residuals (free, combined and total for treated water only), turbidity and pH on submission sheet.

ii) Distribution Samples (standing water)

General Chemistry

- 500 mL plastic bottle (PET 500)
- rinse bottle and cap with sample water three times
- fill to 2 cm from top

Metals

- 500 mL plastic bottle (PET 500)
- rinse bottle and cap three times
- fill to 2 cm from top
- add 10 drops nitric acid (HNO_3)
(Caution: HNO_3 is corrosive)

Steps:

1. Record time of day on submission sheet.
2. Place bucket under tap and open cold water.
3. Fill to predetermined volume.
4. After mixing the water, record the temperature on the submission sheet.
5. Fill general chemistry and metals bottles.
6. Record chlorine residuals (free, combined and total), turbidity and pH on submission sheet.

iii) Distribution Samples (free flow)

General Chemistry

- 500 mL plastic bottle (PET 500)
- rinse bottle and cap with sample water three times
- fill to 2 cm from top

Bacteriological

- 250 mL plastic bottle with white seal on cap
- do not rinse bottle, preservative has been added
- avoid touching bottle neck or inside of cap
- fill to top of red label as marked

Metals

- 500 mL plastic bottle (PET 500)
- rinse bottle and cap three times
- fill to 2 cm from top
- add 10 drops nitric acid HNO_3
(Caution: HNO_3 is corrosive)

Volatiles (duplicate) (OPOPUP)

- 45 mL glass vial with septum
(teflon side must be in contact
with sample)
- do not rinse bottle, preservative
has been added
- fill bottle completely without
bubbles

Organics (OWOC) (OAPAHX)

- 1 L amber glass bottle per scan
- do not rinse bottle
- fill to 2 cm from top

Steps:

1. Record time of day on submission sheet.
2. Let cold water flow for five minutes.
3. Record temperature on submission sheet.
4. Fill all bottles as per instructions.
5. Record chlorine residuals (free, combined and total),
turbidity and pH on submission sheet.

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